

**2014 Manitoba Envirothon  
Regional Trail Test**

**STOP #**

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**Aquatic Ecology**

**This question requires materials provided at the stop.**

Note the photos on the sheet labelled A-A. They show a major Manitoba lake with a serious water quality problem.

1) What is the name of the lake in these photos? (1 pt)

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2) What scientific term do aquatic researchers use for the condition that is affecting water quality in this lake? (0.5 pt)

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3) What plant nutrient is most responsible for causing this problem? (1 pt)

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4) What specific group of organisms is most responsible? (1 pt)

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5) Various human activities contribute to this environmental problem. Circle the identifying letters of the three (3) activities listed below that contribute most significantly to the problem in this lake. Only the first three letters circled will be considered. (1.5 pts - 0.5 pt each)

- a) mining in the lake's watershed
- b) control of the lake's water level for electricity generation downstream
- c) hog farming in the lake's watershed
- d) commercial fishing on the lake
- e) treated sewage effluent from Winnipeg
- f) farming operations in North Dakota & Minnesota

g) forestry operations in the lake's watershed

Table required?	Yes
Supervisor required?	Yes
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	Laminated sheet containing photo images of Lake Winnipeg and the impacts of eutrophication - labelled A-A (A_Eutrophication_A)
Answer to question	1) Lake Winnipeg (1 pt) 2) eutrophication (0.5 pt) 3) phosphorus (1 pt) 4) Cyanobacteria or blue-green algae (1 pt) Partial marks: 0.5 pt for algae or phytoplankton 5) c, e, f (1.5 pts - 0.5 pt each)
Reference to student material	1) Aquatic Ecology, p 18 2), 3), 4) Aquatic Ecology: Accelerated Aquatic Plant Growth, p 43; Lake Ecology: Algae, p 28-29 and Eutrophication, p 35 5) Freshwater Productivity, p 1-3; and Nutrient Cycles: Cycling Phosphorus, p 10-11
Additional information	

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**Aquatic Ecology**

**This question requires materials provided at the stop.**

1) Identify the species of the preserved fish specimen labelled A-A using the Key to Manitoba's Sport Fish. (1 pt)

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2) Using the ruler provided, measure the fork length of the fish labelled A-B and A-C in millimetres. (1 pt - 0.5 pt each)

A-B \_\_\_\_\_ mm

A-C \_\_\_\_\_ mm

3) Sometimes it's not possible to weigh a fish when sampling. Instead, researchers can estimate the weight of a fish by comparing its length to the lengths and weights of other fish of the same species. Using the appropriate graphs, estimate the weights of the fish labelled A-B and A-C in grams. (1 pt - 0.5 pt each)

A-B \_\_\_\_\_ g

A-C \_\_\_\_\_ g

4) When a fish eats other fish, it is classified as a \_\_\_\_\_. When a fish eats zooplankton, it is classified as a \_\_\_\_\_. (1 pt - 0.5 pt each)

5. Name two pieces of equipment that may be used to capture fish. (1 pt - 0.5 pt each)

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Table required?	Yes
Supervisor required?	Yes
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	preserved yellow perch specimen labelled A-A life-sized laminated cutout of a lake trout labelled A-B life-sized laminated cutout of a yellow perch labelled A-C graph for fish A-B (A_fisheries_D.pdf) graph for fish A-C (A_fisheries_E.pdf) Key to Manitoba's Sport Fish (from Regional Kit) fish measuring board or ruler (40-50 cm)
Answer to question	<ul style="list-style-type: none"> <li>1) yellow perch(1 pt)</li> <li>2a) TBD (0.5 pt)</li> <li>2b) TBD (0.5 pt)</li> <li>3a) TBD (0.5 pt)</li> <li>3b) TBD (0.5 pt)</li> <li>4a) piscivore (0.5 pt)</li> <li>4b) planktivore (0.5 pt)</li> <li>5) Any 2 of the following: gill net, seine net, trap net, minnow trap, fishing rod/rod and reel (1 pt - 0.5 pt each)</li> </ul>
Reference to student material	<ul style="list-style-type: none"> <li>1) Key to Manitoba's Sport Fish</li> <li>2) Aquatic Sampling Techniques, p. 7</li> <li>3) Training</li> <li>4) Lake Ecology, p. 21</li> <li>5) Aquatic Sampling Techniques, p. 6</li> </ul>
Additional information	

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**Aquatic Ecology**

1) We humans access water from many sources for many uses. In the list below, circle the most important direct source of water for human use in rural Manitoba. (1 pt)

streams          ponds          lakes          groundwater          snow & ice

2) In the list below, circle the activity that uses the most water from this source in Manitoba. (1 pt)

irrigation      watering livestock      domestic (in home) use      industrial processes  
recreation

3) List four (4) common human-caused sources of contamination to this important water source. (2 pts - 0.5 pt each)

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4) Why does damage to this water source often take so long to recover? (1 pt)

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Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1) groundwater (1 pt)  2) irrigation (1 pt)  3) Any 4 of the following: On-site septic systems, Leaky tanks or pipelines containing petroleum products, Leaks or spills of industrial chemicals at manufacturing facilities, Underground injection wells (industrial waste), Municipal landfills, Livestock wastes, Leaky sewer lines, Chemicals used at wood preservation facilities, Mill tailings in mining areas, Fly ash from coal-fired power plants, Sludge disposal areas at petroleum refineries, Land spreading of sewage or sewage sludge, Graveyards, Road salt storage areas, Wells for disposal of liquid wastes, Runoff of salt and other chemicals from roads and highways, Spills related to highway or railway accidents, Coal tar at old coal gasification sites, Asphalt production and equipment cleaning sites, Fertilizers on agricultural land, Pesticides on agricultural land and forests, Contaminants in rain, snow, and dry atmospheric fallout, Chemicals used in petroleum "fracking" (2 pts - 0.5 pt each)  4) Aquifer recharging and water movement is very slow (residence times are very long), so renewal is slow. (1 pt)</p>
Reference to student material	<p>1) Aquatic Ecology: Groundwater, p 33-34  2) Aquatic Ecology: Water Use, p 58, 62  3) Aquatic Ecology: Groundwater Contamination, p 74  4) Aquatic Ecology: Groundwater Contamination, p 73</p>
Additional information	

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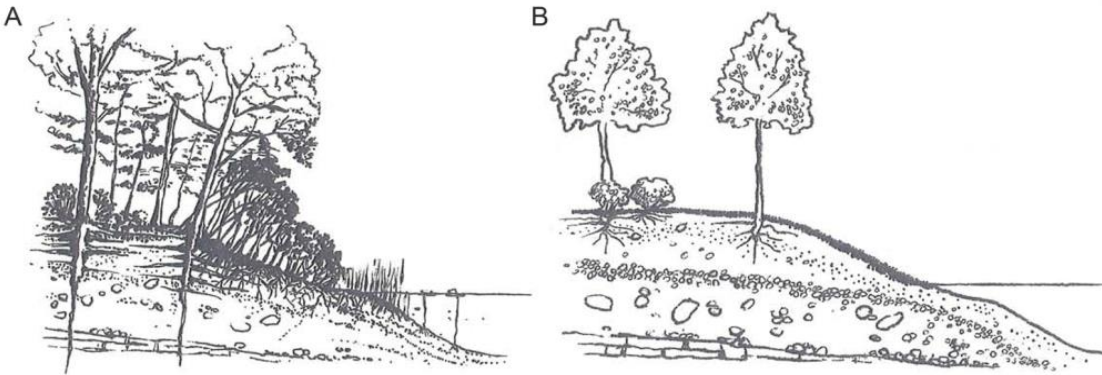
Aquatic Ecology

1) What is a riparian area (or shoreland)? (0.5 pt)

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2) Look at the picture. Which of these two pictures depicts a healthy, natural riparian area? Circle the appropriate answer. (0.5 pt)?



3) List four (4) functions/ecological services that a healthy riparian area provides. (2 pts - 0.5 pt each)

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4) You are a farmer with a river running through your property. Name two (2) management practices that you can implement to prevent your farming practices from having a negative impact on the water quality downstream. Briefly describe one (1) associated benefit for each practice. (2 pts - 0.5 pt each).

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Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1) Any 1 of the following: Riparian areas are transitional between the aquatic and upland areas (or between land and water); "wetter than dry" but "drier than wet"; have abundance of water, either on the surface or close to the surface; characterized by vegetation that responds to, requires and survives well in abundant water; characterized by saturated soil that supports water-loving plants. (0.5 pt)</p> <p>2) A (0.5 pt)</p> <p>3) Any 4 of the following: trap sediment, build and maintain banks, store water/energy, recharge groundwater, filter water/filter sediment out of water, maintain stream flows late in season, provide habitat, stabilize shoreline, maintain biodiversity, create primary productivity, safeguard water quality, maintain water temperatures (2 pts - 0.5 pt each)</p> <p>4) Any 2 of the practices (1 pt - 0.5 pt each) PLUS any 1 of the corresponding benefits for each (1 pt - 0.5 pt each) <b>RESTRICT LIVESTOCK ACCESS AND/OR HEAVY EQUIPMENT IN THE RIPARIAN AREA</b> - This helps to protect the riparian area by preventing soil compaction and allowing native vegetation to grow and thrive. Soil is capable of holding water during spring flooding (this property is compromised when the soil is compacted), and native vegetation have deep roots that bind the soil and prevent streambank erosion.</p> <p><b>PLANT A BUFFER</b> - A buffer zone of native plants provides deep binding root mass for streambank stabilization and to trap sediment. The overhanging vegetation are important for moderating the water temperature, and plant material and bugs that fall off of plants provide a food source for aquatic organisms. Buffers also provide a habitat corridor for wildlife and are a great way to attract pollinators. <b>STABILIZE THE BANK WITH NATIVE VEGETATION SUCH AS WILLOW</b> - Willow are a fast growing riparian species that have deep roots. See above notes for the importance of deep binding roots. They are also capable of resisting ice damage, and they can survive through periodic flooding. <b>MANAGE MANURE AND STORE WELL AWAY FROM SURFACE WATER</b> - Proper manure management ensures that the nutrients stay on the farmland to benefit the crops, and are prevented from leaching or running off into the waterways, where they can lead to eutrophication.</p>
Reference to student material	<p>1) Managing the Water's Edge, p 7; Protecting your Shorelands, p 1-8</p> <p>2) On the Living Edge, p 13-15</p> <p>3) Managing the Water's Edge, p 9-11</p> <p>4) Protecting your Shorelands, p 1-8</p>
Additional information	

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**STOP #**  
**Forestry**

1) What is forest certification? (2 pts)

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2) What does the term "Chain of Custody" describe with regards to certification? (1.5 pts)

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3) There are three types of forest certification in North America. Their acronyms are SFI, CSA and FSC. Find the full names of these three (3) kinds of certification in the word search below. (1.5 pts - 0.5 ea)

S	T	E	W	A	R	D	S	F	O	R	E	S	T	I	N	C	O	R	P	O	R	A	T	E	D	F	M	A
U	F	U	D	G	E	F	W	O	E	R	C	T	H	I	C	K	O	R	Y	U	P	S	D	F	G	O	A	C
S	O	O	N	E	R	O	I	R	E	M	A	U	S	T	R	I	A	N	P	I	N	E	L	J	H	R	N	E
T	R	S	R	U	S	R	M	E	N	E	N	G	E	L	M	A	N	N	S	P	R	U	C	E	B	E	I	R
A	E	W	E	E	D	E	H	S	E	S	A	C	E	R	T	T	R	E	W	B	O	P	C	A	V	S	T	S
I	S	I	D	E	S	S	O	T	I	R	D	S	O	I	L	S	I	O	K	C	A	R	A	M	A	T	O	S
N	T	H	U	J	A	T	R	S	W	H	I	T	E	S	P	R	U	C	E	F	R	U	N	B	V	S	B	A
A	R	E	A	F	W	S	S	S	E	B	A	L	S	A	M	F	I	R	S	D	N	E	A	U	I	U	A	C
B	Y	S	P	A	I	T	E	T	S	R	N	E	X	Q	U	S	B	I	R	C	H	S	D	T	B	S	M	C
L	A	R	I	X	L	A	C	A	E	P	S	Y	R	U	W	A	S	P	R	U	C	E	I	T	U	T	A	H
E	L	M	N	Q	D	N	H	N	N	W	T	F	W	A	E	R	E	I	H	T	U	O	A	E	R	A	P	A
F	H	J	E	K	L	D	E	D	V	H	A	O	L	T	O	P	N	I	T	U	Y	T	N	R	N	I	L	R
O	G	F	Y	D	I	A	S	A	I	I	N	R	S	I	A	C	O	V	E	K	B	N	S	N	U	N	E	I
R	E	W	A	S	F	R	T	R	R	T	D	E	D	C	G	H	C	J	K	L	A	M	U	U	M	A	F	N
E	R	T	E	Y	E	D	N	D	O	E	A	S	O	S	U	K	E	P	L	H	G	F	S	T	S	B	R	U
S	I	N	G	F	D	S	U	S	N	B	R	T	U	S	H	Z	N	C	V	O	B	N	T	M	D	I	A	M
T	O	A	D	S	W	C	T	C	T	A	D	R	G	E	R	I	I	B	N	H	M	O	A	T	O	L	X	B
C	E	D	A	R	P	O	I	H	H	R	S	Y	L	U	E	Y	P	T	R	I	E	W	I	Q	G	I	I	O
E	Y	L	K	J	H	M	G	A	O	K	A	I	A	F	L	D	I	C	P	O	S	A	N	Z	W	T	N	X
R	E	P	I	N	E	M	I	R	N	P	S	S	S	K	P	L	N	M	O	B	N	V	A	C	O	Y	U	E
T	E	Z	R	E	D	I	R	T	E	I	S	G	F	L	A	T	U	D	N	U	C	K	B	A	O	C	S	D
I	S	D	E	E	R	T	E	E	B	N	O	R	I	S	M	A	S	C	D	C	N	R	I	S	D	O	N	L
F	W	S	W	R	S	T	F	R	V	E	C	E	R	I	D	M	S	A	E	K	F	C	L	O	T	A	I	E
I	I	T	A	O	D	E	H	K	I	W	I	A	F	D	E	A	T	C	R	E	G	D	I	I	K	L	G	R
C	L	E	L	R	O	E	H	O	L	E	A	T	E	E	R	R	R	B	O	Y	H	S	T	L	L	I	R	Q
A	D	A	N	E	R	D	I	R	T	D	T	A	X	U	S	C	O	N	S	E	A	A	Y	S	P	T	A	W
T	L	M	U	D	N	E	L	N	E	G	I	N	K	G	O	K	B	L	A	D	L	W	A	J	O	I	Y	E
I	I	W	T	E	L	O	P	E	G	E	O	L	O	R	F	E	U	M	I	S	T	E	C	S	C	O	T	S
O	F	A	E	M	O	U	N	T	A	I	N	A	S	H	A	R	S	O	F	V	S	R	T	H	I	N	U	R
N	E	D	S	U	G	A	R	M	A	P	L	E	S	Y	R	U	P	L	K	A	E	F	G	E	L	D	E	R
S	U	S	T	A	I	N	A	B	L	E	F	O	R	E	S	T	R	Y	I	N	I	T	I	A	T	I	V	E

Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/P rops/ Samples required	
Answer to question	<p>1) Forest Certification is primarily about providing objective evidence of sustainable forestry management including social and community expectations. (1pt) Includes an independent audit, where independent experts verify a company’s performance against a set of objective standards and procedures for sustainability. (1 pt)</p> <p>2) Tracking a forest product (0.5 pt) such as lumber from the time of harvest, through transportation, to processing and shipping, delivery and point of sale (0.5 pt) to ensure sustainable and environmental and methods are always followed (0.5 pt)</p> <p>3) SFI = Sustainable Forestry Initiative, CSA = Canadian Standards, FSC = Forest Stewardship Council (1.5 pts - 0.5 pt each)</p> <p>S T E W A R D S F O R E S T I N C O R P O R A T E D F M A  U F U D G E F W O E R C T H I C K O R Y U P S D F G O A C  S O O N E R O I R E M A U S T R I A N N P I N E L J H R N E  T R S R U S R M E N E N G E L M A N N S P R U C E B E I R S  A E W E E D E H S E S A C E R T T R E W B O P C A V S T S  I S I D E S S O T I R D S O I L S I O K C A R A M A T O S  N T H U J A T R S W H I T E S P R U C E F R U N B V S B A  A R E A F W S S S E B A L S A M F I R S D N E A U J U A C  B Y S P A I T E T S R N E X Q U S B I R C H S D T B S M C  L A R I X L A C A E P S Y R U W A S P R U C E I T U T A H  E L M N Q D N H N N W T F W A E R E I H T U O A E R A P A  F H J E K L D E D V H A O L T O P N I T U Y T N R N I L R  O G F Y D I A S A I I N R S I A C O V E K B N S N U N E I  R E W A S F R T R R T D E D C G H C J K L A M U U M A F N U  E R T E Y E D N D O E A S O S U K E P L H G F S T S B R U  S I N G F D S U S N B R T U S H Z N C V O B N T M D I A M  T O A D S W C T A D R G E R I I B N H M O A T O L X B  C E D A R P O I H H R S Y L U E Y P T R I E W I Q G I I O  E Y L K J H M G A O K A I A F L D I C P O S A N Z W T N X  R E P I N E M I R N P S S S K P L N M O B N V A C O Y U E  T E Z R E D I R T E I S G F L A T U D N U C K B A O C S D  I S D E E R T E E B N O R I S M A S C D C N R I S D O N L  F W S W R S T F R V E C E R I D M S A E K F C L O T A I E  I I T A O D E H K I W I A F D E A T C R E G D I I K L G R  C L E L R O E H O L E A T E E R R R B O Y H S T L L I R Q  A D A N E R D I R T D T A X U S C O N S E A A Y S P T A W  T L M U D N E L N E G I N K G O K B L A D L A J O I Y E  I I W T E L O P E N E G E O L O R F E U M I S T E C S C O T S  O F A E M O U N T A I N A S H A R S O F V S R T H I N U R  N E D S U G A R M A P L E S Y R U P L K A E F G E L D E R  S U S T A I N A B L E F O R E S T R Y I N I T I A T I V E</p>
Reference to student material	1) and 2) Certification and Canada's Forest, p 5 3) Certification and Canada's Forest, p 7
Additional information	

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**Forestry**

**This question requires materials provided at the stop.**

1) Look at the photo labelled F-A.

a) What are the globs on the outer bark of the tree called? (0.5 pt)

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b) What forest pest produces these globs on the bark of the tree? (0.5 pt)

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2) This forest pest is not native to, and is not yet present in, Manitoba. What part of Canada is it native to? (1 pt)

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3) Name one (1) pathway by which this forest pest may enter Manitoba. (1pt)

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4) Which native Manitoba tree would be most likely to be attacked by this forest pest? (1pt)

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5) Name another non-native forest pest that has already established itself in Manitoba. (1 pt)

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Table required?	Yes
Supervisor required?	Yes
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	Picture of Mountain Pine Beetle pitch tubes, labelled F-A Field Guide Native Trees of Manitoba
Answer to question	1a) Pitch tubes (0.5 pt) 1b) mountain pine beetle (0.5 pt) 2) Western North America (British Columbia, Alberta) (1pt) 3) Any 1 of the following: untreated or wood with bark still in tact may travel across Canada and enter Manitoba via the lumber industry, beetle could spread east across Canada's boreal forest or firewood (1 pt) 4) Jack pine (1 pt) 5) Dutch elm disease ( <a href="#">list from FHPA</a> )(1pt)
Reference to student material	<a href="http://www.gov.mb.ca/conservation/forestry/health/mt-pine-beetle.html">http://www.gov.mb.ca/conservation/forestry/health/mt-pine-beetle.html</a> <a href="http://www.nrcan.gc.ca/forests/insects-diseases/13397">http://www.nrcan.gc.ca/forests/insects-diseases/13397</a> Forestry Document, p 1) 2) 3) Five-Year Report on the Status of Forestry, p 43 4) Field Guide Native Trees of Manitoba, p 26 5) Five-Year Report on the Status of Forestry, p 38, 43
Additional information	

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**Forestry**

**This question requires materials provided at the stop.**

1) Using the Native Trees of Manitoba or your own general knowledge, identify these native tree samples labelled F-A, F-B, F-C and F-D. (2 pts - 0.5 pt each)

F-A \_\_\_\_\_

F-B \_\_\_\_\_

F-C \_\_\_\_\_

F-D \_\_\_\_\_

2) Using the Suunto clinometer and Diameter Tape, measure the trees labelled F-E and F-F. Record your measurements in the spaces provided. (2 pts - 0.5 pt each)

F-E Diameter \_\_\_\_\_ cm Height \_\_\_\_\_ m

F-F Diameter \_\_\_\_\_ cm Height \_\_\_\_\_ m

3) Tree diameter is normally measured at a standardized place on the tree called \_\_\_\_\_ . This place is defined as \_\_\_\_\_ (m or ft) from the ground." (1 pt – 0.5 ea)

Table required?	Yes
Supervisor required?	Yes
Local feature required?	Yes
Local feature required	trees for ID, trees for measuring
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	Suunto clinometer; flagging tape; perm marker; on-site trees and/or branch and twig samples to identify labelled F-A, F-B, F-C, and F-D; 50m measuring tape; diameter tape; Native Tree Guide; on-site trees to measure labelled F-E and F-F
Answer to question	Regional host responsible to provide TBD answers to Steering Committee for test marking purposes. 1) TBD on site - full common or Latin name required (2 pts - 0.5 pt each) 2) TBD on site (2 pts - 0.5 pt each measurement) Partial marks: a marking range will be developed once measurements are determined 3) Breast Height, 1.3 m or 4.5 ft (1 pt - 0.5 pt each)
Reference to student material	1), 2) and 3) Training
Additional information	1) Ensure additional labelled samples of all testing material on hand in case of damage or "overuse". Stop attendant should monitor samples and replace as needed, making sure labelling is correct. 2) Ensure extra clinometers and d-tapes on hand in case they walk away. Set up the exact spot to measure the tree height from and mark the distance to target tree on tape so that students can utilize the correct equipment scale.

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**Forestry**

1) The "Three Sisters" is a form of polyculture in which corn, beans and squash are planted together. This was done by generations of First Nations people in North America, long before European presence on the continent. The plants beneficially affect each other, as well as the soil.

a) List two (2) ways in which this practice contributed to sustainable agriculture of First Nations people. (1 pt - 0.5 pt each)

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b) What are two (2) methods that were used by First Nations people to pass information from generation to generation? (1 pt - 0.5 pt each)

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c) What term is commonly used to describe the information about the natural world that is passed between generations? (1 pt)

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2) List two (2) examples of non-timber forest products (NTFP) that might be sold as a product at a farmers market. (2 pts - 1 pt each)

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Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1a) Any 2 of the following: conserves species biodiversity, conserves pollinator diversity, helps control pests and diseases, supports soil community, increases efficiency of nutrient cycling, reduces risk of total crop failure (1 pt - 0.5 pt each)</p> <p>1b) Any two of the following: story/legend, song, traditional ceremony, other options to be considered by Marker (2 pts - 1 pt each)</p> <p>1c) Traditional Ecological Knowledge (1 pt) Partial marks: TEK (0.5 pt)</p> <p>2) Any two of the following: berries, syrup, wood crafting, walking stick, other options to be considered by Marker (2 pts - 1 pt each)</p>
Reference to student material	<p>1a) Theme Document, p 38, 40</p> <p>1b) and 1c) Training</p> <p>2) Training and Chief Kerry's Moose, p 2 (examples)</p>
Additional information	

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**Soils and Land Use**

1) Soils form and progressively develop under the influence of four soil forming factors acting over time. List two (2) of these four factors. (2 pts - 1 pt each)

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2) A dark coloured topsoil indicates high \_\_\_\_\_ content. (1 pt)

3) A strongly leached (Ae) horizon is characteristic of a \_\_\_\_\_ soil. (1 pt)

4) The native vegetation of Chernozemic soils is predominantly \_\_\_\_\_. (1 pt)

Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1) Any 2 of the following: Parent material, Relief (also topography, drainage), Climate, Organisms (also vegetation, humans) (2 pts - 1 pt each)</p> <p>2) Organic matter (1 pt)</p> <p>3) Luvisolic (also eluvial or eluviated) (1 pt)</p> <p>4) Grassland (1pt)</p>
Reference to student material	<p>1) Soil Management Guide, p 4</p> <p>2) Soil Management Guide, p 14</p> <p>3) Soil Management Guide, p 21</p> <p>4) Soil Management Guide, p 10, 19</p>
Additional information	

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**STOP #**

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**Soils and Land Use**

1) Soil water can exist in two forms in pore spaces; as free water, and as a tightly held film on the surfaces of soil particles. List three distinct ways that soil water in pore spaces can leave a soil. (3 pts - 1 pt each)

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2) Apart from the influences of gravity, soil water can also undergo matric flow from wet to dry areas. List two forces that drive matric flow. (1 pt - 0.5 pt each)

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3) What is described by both the Liquid Limit and the Plastic Limit? (1 pt)

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Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	1) Drain as ground water, Evaporation, Plant uptake (3 pts - 1 pt each) 2) Adhesion, Cohesion (1 pt - 0.5 pt each) 3) soil moisture (1 pt)
Reference to student material	1) Soils and Land Use Document, p 17 2) and 3) Soil Management Guide – Water Use and Moisture Management
Additional information	

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**Soils and Land Use**

**This question requires materials provided at the stop.**

Using the soil sample and equipment provided, answer the following questions.

1) Define soil texture. (1 pt)

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2) What is the texture of the soil provided? (1 pt)

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3) What is the colour of the soil? (Using the Munsell colour chart.) (1 pt)

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4) Are carbonates present in the soil? (1 pt)

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5) What parent material is the most common source of calcium carbonates in soil? (1 pt)

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Table required?	Yes
Supervisor required?	Yes
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	sample of soil hand texturing chart HCl paper towels water (in a squirt bottle and also for clean up) Munsell 10YR colour chart
Answer to question	<ol style="list-style-type: none"> <li>1) The proportion of silt, sand and clay sized particles or the proportion of silt, sand and clay (1 pt)</li> <li>2) TBD (1 pt)</li> <li>3) 10YR TBD/TBD (0.5 pt for correct hue (10YR), 0.5 pt for correct value/chroma)</li> <li>4) TBD, but I'm guessing no (1 pt)</li> <li>5) Limestone (1 pt)</li> </ol>
Reference to student material	<ol style="list-style-type: none"> <li>1) Soils and Land Use Document, p.15</li> <li>2) Soils and Land Use Document, p.27 and Training</li> <li>3) and 4) Training</li> <li>5) Soil Management Guide - Calcium Carbonate Content</li> </ol>
Additional information	

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**Soils and Land Use**

**This question requires materials provided at the stop.**

Find SW19-10-20W on the provided map.

1) What is the full name of the dominant soil series on this piece of land? (1 pt)

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2) According to the map, what is/are the limitation(s) for this soil? (1 pt)

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3) What is the agricultural capability for this soil? (1 pt)

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4) Would you use this soil for annual cropping? Why or why not? (1 pt)

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5) What would concern you about using this site as a septic field? (1 pt)

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Table required?	Yes
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	Copy of soil map number 12, agricultural capability section and engineering interpretations of soils from Soils of the Brandon Region Study Area OR the whole soil survey - depends what I can get
Answer to question	<p>1) Stockton (1pt) Note: Sn is not an acceptable answer!</p> <p>2) weakly eroded and 2-5% slope (1 pt - 0.5 pt each)</p> <p>3) 4x (1 pt)</p> <p>4) Either yes or no is acceptable (no points given for that answer), but their explanation should have something about "severe limitations that restrict the choice of crops or require special conservation practices or both. These soils have such limitations that they are only suited for a few crops, or the yield for a range of crops may be low or the risk of crop failure is high" and/or "Proper management of these soils requires multiple practices and suitability for production is limited." (1 pt)</p> <p>5) rapid permeability, possible pollution hazard to groundwater (1 pt)</p>
Reference to student material	1) - 5) Training and Understanding Western Canadian Dominion Land Survey System/The Manitoba Grid
Additional information	

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**Theme**

1) How does the local food movement reduce greenhouse gas contributions? (1 pt)

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2) Indicate whether the following statement is true (T) or false (F) by circling the correct answer.

**T   F**    By definition, locally grown food is sustainably produced. (1 pt)

3) List two (2) ways to access locally grown food described in the Manitoba Government's "Local Produce Guide (2013). (1 pt - 0.5 pt each)

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4) List four (4) factors that consumers consider when selecting which foods to buy. (2 pt - 0.5 pt each)

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Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1) It shortens travel distance of food (1 pt)</p> <p>2) F (1 pt)</p> <p>3) Any 2 of the following: farmers markets, market stands on roadside or farmers' property, U-pick gardens, Community Supported Agriculture farms (CSAs) (1 pt - 0.5 pt each)</p> <p>4) cost, nutritional quality, where it comes from, how it is produced (if it is sustainable or humane), (2 pts - 0.5 pt each)</p>
Reference to student material	<p>1) Theme Document, p 58</p> <p>2) Theme Document, p 48</p> <p>3) Theme Companion Documents, p 137</p> <p>4) Theme Document, p 51, 52</p>
Additional information	consistent with outcomes 23, 24, 26

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**Theme**

**This question requires materials provided at the stop.**

You are given 4 jars of beads, labelled T-A, T-B, T-C, and T-D. Beads of different shapes and construction (ie. wood versus plastic) represent different species of crop, livestock and native flora or fauna. Colour represents variation within a species. One jar represents monoculture (the raising of crops or livestock with extremely low diversity in a large area) and the other three jars represent the three types of biodiversity: genetic, species and ecosystem.

1) Write the type of diversity, or indicate if it is a monoculture, in the blank next to the letter of the corresponding jar. (2 pts - 0.5 pt each)

T-A \_\_\_\_\_

T-B \_\_\_\_\_

T-C \_\_\_\_\_

T-D \_\_\_\_\_

2) Which jar reflects biodiversity provided by permaculture, agroforestry, and mixed farming? (1 pt)

\_\_\_\_\_

3) Which jar reflects biodiversity provided by using polyculture as a food production practice? (1 pt)

\_\_\_\_\_

4) Which jar represents a system that would experience the greatest impact if one of its crop or livestock species were sickened or eliminated by disease or adverse weather? (1 pt)

\_\_\_\_\_

Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	four bottles of beads, labelled T-A, T-B, T-C, and T-D
Answer to question	1) T-A Ecosystem diversity, T-B Monoculture, T-C Species Diversity, T-D Genetic Diversity (2 pts - 0.5 pt each) 2) T-A (1 pt) 3) T-C (1 pt) 4) T-B (1 pt)
Reference to student material	1) Theme Document, p 37 2) Theme Document, p 37-39 3) Theme Document, p 37- 38 4) Theme Document, p 37
Additional information	consistent with outcome 13



Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1) things that happen (processes) in ecosystems to make them work including: physical, chemical and biological linkages among components via energy flows and matter cycles, and interactions among living components (1 pt - must have some sense of 3 parts listed, but correct terminology not required) Partial marks: 0.5 pt if any of the three parts is not included</p> <p>2) Any 3 of the 4 matter cycles (1.5 pts - 0.5 pt each) PLUS any 1 of the corresponding examples for each (1.5 pts - 0.5 pt each - correct terminology not required)</p> <p><b>WATER CYCLE</b> - livestock drinking water sources; water application to crops; rain and runoff replenishing water for crops and livestock; water being polluted by livestock or cropping practices; livestock, crops and decomposers respiring or transpiring water to the atmosphere; water carrying nutrients to crops; water carrying nutrients or sediment through or away from agricultural lands; crops and forages using water in photosynthesis and/or respiration; cropping and livestock management practices affecting infiltration and runoff of water; plants can filter agricultural nutrients and sediments from water</p> <p><b>CARBON CYCLE</b> - manure application to soil; release of carbon compounds from manure, compost or dead plant material into soil through decomposition by microorganisms; leaves of crops and forages absorbing sun energy to help fix atmospheric carbon into food carbon; anaerobic respiration or decomposition producing methane; aerobic respiration or decomposition producing carbon dioxide; carbon compounds exiting the farm through leaching or surface runoff; energy stored in forages or crops follows the food chain through livestock and humans; harvesting crops and livestock removes carbon from the farm; crop and livestock management practices affect the depth in the soil where roots grow and place carbon compounds; enteric methane produced by ruminant livestock (rabbits, horses, donkeys, sheep, goats, cattle, llamas, alpacas, camels, deer, bison, etc)</p> <p><b>NITROGEN CYCLE</b> - ammonia, nitrate, urea fertilizers added to crops and forages; compost, dead plants, manure, and residual feed adding nutrients to crops and forages; livestock consume forages and legumes which add nitrogen to their tissues and create chemical compounds; nitrogen passes through livestock in their waste; crops uptake nitrogen and use it to build tissue and chemical compounds; nitrogen in crop and animal tissues removed from the land during harvest; nitrogen moves across or from the farm in leachate, erosion, volatilization or denitrification; healthy soil biota fix nitrogen from the atmosphere alone or with the help of legumes; lightning fixes atmospheric nitrogen into useable form for crops; burning of crop residues or fossil fuels used by machinery releases nitrogen to atmosphere; legumes die and add their nitrogen to the soil in organic form; land management practices affect soil water content, which in turn affects nitrous oxide release levels</p> <p><b>PHOSPHORUS CYCLE</b> - animal and plant residues degrading and adding phosphorus to the soil; animal waste returns phosphorus back to the soil; soil</p>

	<p>microbes degrade livestock and crop residues; phosphorus is held on the land by soil (clay); phosphorus is made available to crops and forages in dissolved form; animals and crops uptake phosphorus for use in tissue and chemical compounds; phosphorus is added to the farm as chemical fertilizer or other organic additives like compost, manure, etc; phosphorus is removed from the system by harvesting crops or removing livestock; phosphorus is transported across the farm or off the farm via erosion and runoff of soil, manure and plant and residues; phosphorus exits the farm in sediments that settle to the bottom of lakes or wetlands and eventually return to rock form; <b>NOTE THAT PHOSPHORUS NEVER ENTERS THE ATMOSPHERE</b>, so no answers indicating interaction with atmosphere will be acceptable</p> <p>3) ecosystem functions that support human life and activity (1 pt)</p>
Reference to student material	<p>1) Theme Document, p 16  2) Theme Document, p 21 - 28 (including diagrams)  3) Theme Document, p 16</p>
Additional information	Consistent with outcomes 4 and 8



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**STOP #**

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**Theme**

1) One of these four statements is incorrect. Circle the incorrect statement AND change it to make it correct. (2 pts)

- a) Organic agriculture is not the only way of producing food sustainably.
- b) Organic certification does not guarantee that food has been produced sustainably.
- c) Antibiotics can be used in a sustainable manner to ensure health of livestock.
- d) Organically produced food is transported shorter distances than food produced by conventional agriculture.

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2) List the three pillars of sustainability (1.5 Pts – 0.5 ea.). For each pillar, give a brief description of one (1) way people or communities benefit from agricultural sustainability practiced in their neighborhood. (1.5 Pts – 0.5 ea.)

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Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1) d); Organically produced food is NOT ALWAYS transported shorter distances than food produced by conventional agriculture OR, Organically produced food CAN BE transported LONGER distances than food produced by conventional agriculture (1 pt for selecting d, 1 pt for correcting statement)</p> <p>2) All 3 of the pillars (1.5 pts - 0.5 pt each) PLUS any 1 of the corresponding benefits for each (1.5 pts - 0.5 pt each)</p> <p>ECONOMY - long term farm community revenue; long term farm community employment; greater economic return to farmer with fewer middlemen; greater long term income to farmer/family; farmer control over prices; higher standard of living; less reliance on subsidies; local businesses have more customers; local businesses have more revenue; jobs; entrepreneurship opportunity in agri-food/agri-business</p> <p>ENVIRONMENT - local ecosystem health; healthy soil; productive soil; properly functioning nutrient cycles; clean air; clean water; more wildlife; more biodiversity; less pollution; less waste; efficient or appropriate land use; optimal resource use</p> <p>SOCIETY - food security; fresher food; healthier food; relationships among farmers and consumers; direct feedback from consumers to farmers; connection to food; community cooperation; accessibility to new or immigrant farmers; farm succession or involvement of next generation; time for hobbies or other extra-curricular activities; fair treatment of farm workers; humane treatment of animals; capacity to support community institutions; scenic beauty of community; positive impression of farming as a profession</p>
Reference to student material	<p>1) Theme Document, p 41-42; Companion Documents p 109-110</p> <p>2) Theme Document, p 14-16, 48-49</p>
Additional information	Consistent with outcomes 1, 2, 17, 18, 22

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**STOP #**

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**Wildlife**

**This question requires materials provided at the stop.**

- 1) Examine the skull provided.
  - a) Calculate the dental formula. (2.5 pts)

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- b) Identify the species the skull belongs to, using the dental formula. (0.5 pts)

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- 2) What is the purpose of the carnassial tooth? (1 pt)

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- 3) What is the purpose of the cheek teeth? (1 pt)

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Table required?	Yes
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	Raccoon Skull Peterson's Field Guide to Mammals (contains dental formulas)
Answer to question	1a) I 3/3, C 1/1, P 4/4, M 2/2 = 40 (2.5 pts - 0.5 pt each for incisor, carnassial, premolar, molar and total number) 1b) Raccoon (0.5 pt) 2) The carnassials are a pair of teeth on each side of jaw that do most of the shearing action when a carnivore is eating meat. (1 pt) 3) These teeth do most of the mastication of the food. (1 pt)
Reference to student material	1 Wildlife Document, p 18-20 2) Wildlife Document, p 20 3) Wildlife Document, p 21
Additional information	

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**Wildlife**

**This question requires materials provided at the stop.**

1) Identify the wildlife species whose furs are labelled W-A, W-B and W-C. (3 pts - 1 pt each)

W-A \_\_\_\_\_

W-B \_\_\_\_\_

W-C \_\_\_\_\_

2) Explain how a beaver makes its fur waterproof. (1 pt)

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3) Name another water-adapted rodent with waterproof fur similar to a beaver. (1 pt)

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Table required?	Yes
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/ Samples required	3 pelts labelled W-A, W-B and W-C
Answer to question	1)W-A: TBD, W-B: TBD, W-C: TBD (3 pts - 1 pt each) 2) Beavers have two oil glands beneath their skin on their lower bellies. They comb this oil into their fur to make it waterproof. (1 pt) 3) Muskrat (1 pt)
Reference to student material	1) Training 2) Mammals of Manitoba, p 6-7 3) Mammals of Manitoba, p 8
Additional information	

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**Wildlife**

**This question requires materials provided at the stop.**

Your team is sampling a closed population of rabbits, represented by beans in a container. Your objective is to estimate the entire population of rabbits. Individuals are caught using Sherman live-traps, counted, and released. On the first night of trapping, 20 rabbits were caught and were also marked, represented by a bean with a dot. In order to estimate the population, your team must trap rabbits on 2 more nights. The total number of rabbits caught (C) and the number of marked (or recaptured) rabbits (R) are counted each night, and the rabbits are released.

For each night (or trial), shake the container and remove 10 rabbits (C), count how many marked rabbits (R) are present in the sample and record below, and then return the rabbits to the container.

1) Record the number of marked rabbits (R) below. (1 pt)

Trial #1 \_\_\_\_\_

Trial #2 \_\_\_\_\_

2) Using the Peterson method, calculate the total population size (N) for each trial, using the formula  $N=(MC)/R$ . (2 pts – 1 pt each)

Trial #1: \_\_\_\_\_  
\_\_\_\_\_

Trial #2: \_\_\_\_\_  
\_\_\_\_\_

3) Calculate the estimated size of the rabbit population based on these trials. (1 pt)

\_\_\_\_\_

4) The survey is only catching a small number of individuals. Write the adjusted FORMULA that corrects for small sample size. (1 pt)

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Table required?	Yes
Supervisor required?	Yes
Local feature required?	No
Local feature required	
Hands on question?	This question requires materials provided at the stop.
Equipment/Props/Samples required	40 Beans in container, with 20 marked with a dot Calculator
Answer to question	<p>1) Results of both trials recorded with 10 individuals or less (1 pt - 0.5 pt each)</p> <p>2) Population sizes for both trials calculated correctly using following formula: <math>(N=(MC)/R)</math>, where M (number marked individuals) = 20, C (number of individuals captured in resampling) = 10, and R (number of recaptured individuals – the number of marked beans each team ‘captures’) (2 pts - 1 pt each)</p> <p>If R = 1, N= (20x10)/1 = 200; R = 2/N=100; R = 3/N=66.67; R = 4/N=50; R = 5/N=40; R = 6/N=33.3; R = 7/N=28.6; R = 8/N= 25; R = 9/ N=22.2; R = 10/N=20</p> <p>3) Estimated population size calculated correctly using the following formula: (Sum of 2 estimated populations from question 2)/2 (1 pt)</p> <p>4) <math>Nc= [((M+1) \times (C+1))/(R+1)] - 1</math> (1 pts)</p>
Reference to student material	1) - 4) Wildlife Document, p 50-53
Additional information	



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**STOP #**

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**Wildlife**

1) One way mammals survive through winter is with physiological strategies that are characterized by periods of decreased heart rates and body temperature. For each of the three strategies listed below, define the term (3 pts - 1 pt each). Give an example of one mammalian wildlife species that utilizes the strategy (1.5 pts - 0.5 pt each).

Strategy	Definition	Example
True hibernation		
Seasonal lethargy		
Daily torpor		

2) Other mammals stay active throughout winter. Name one BEHAVIOURAL adaptation used by a mammalian wildlife species that stays active in winter. (0.5 pt)

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Table required?	No
Supervisor required?	No
Local feature required?	No
Local feature required	
Hands on question?	No
Equipment/Props/ Samples required	
Answer to question	<p>1) Definitions (3 pts - 1 pt each); Examples (1.5 pts - 0.5 pt each)</p> <p>TRUE HIBERNATION - body temperature approaches that of the environment with drastic reductions in metabolic rate, effectively becoming "cold-blooded"; ground squirrels, bat, groundhogs, woodchuck, jumping mouse, etc.</p> <p>SEASONAL LETHARGY - body temperature does not approach that of the environment with regular intervals of increased activity; black bear, badger, etc.</p> <p>DAILY TORPOR - period of decreased body temperature / metabolic rate that lasts less than 24 hours; mice, etc.</p> <p>2) Any 1 of the following: being active beneath snow (sub-nivean), caching food, sleeping in shelter/covered in snow/curled up, increasing food intake (0.5 pts)</p>
Reference to student material	<p>1a) Wildlife In Winter, p 1</p> <p>1b) and 1c) Wildlife In Winter, p 2</p> <p>2) Wildlife In Winter, p 3</p>
Additional information	