

For markers' use only				
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

Team #
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# 2013 MANITOBA ENVIROTHON TRAIL TEST

## **STOP 1**

### **Aquatic Ecology (2 pts) – Stop 1**

1) Fill in the blanks in the following paragraph using words from the word bank provided. (2 pts - 0.5 pt each)

The overall cycling of water in nature involves both aquatic and terrestrial ecosystems and the air above them. A water molecule is made up of \_\_\_\_\_ hydrogen atoms and one oxygen atom. The loss of water through pores in the leaves of plants is called \_\_\_\_\_. The sun heating the water on a lake causes \_\_\_\_\_ and the vapour rises into the atmosphere. Water that falls back to the ground soaks into the ground by a process called \_\_\_\_\_.

Word Bank

*evaporation*      *two*      *transpiration*      *capillarity*      *one*  
*condensation*      *three*      *percolation*      *runoff*

### **Forestry (2 pts) – Stop 1**

Look carefully around this stop.

1) Name the potential threat to trees and forest present at this stop. (1 pt)

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Page Total
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2) Give 2 examples why it is a potential threat to our trees and forests. (1 pt - 0.5 pt each)

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**Soils and Land Use (10 pts) – Stop 1**

***This question requires you to use materials provided at the stop.***

1) Indicate whether each statement is true (T) or false (F) by circling the correct answer. (5 pts - 0.5 pt each)

- T F Root crop harvesting can cause more tillage erosion than plowing.
- T F The maximum tolerable soil loss is 50 tons/acre/year, the equivalent of 7.5 mm on a well developed soil.
- T F Wind erosion increases as the soil moisture content decreases.
- T F Soil erodibility is affected by permeability of the least permeable soil layer.
- T F Blowing soil may be controlled by emergency tillage on coarse sandy soils.
- T F Suspension, saltation, and surface creep are all terms used to describe water erosion of soil.
- T F A 30 mph (48 km/h) wind has more than three times the erosive power of a 20 mph (32 km/h) wind.
- T F Tillage erosion occurs only from tillage operations.
- T F The most susceptible period for soil erosion by water is July to August.
- T F Standing stubble is more effective than flat stubble in preventing water erosion.

2) Using the metre stick, determine the percent ground cover at this stop in the region to the left of the marker. Take 5 readings and average the results. Show all work. (5 pts - 3 pts for 5 Readings, 2 pts for Percent ground cover)

**Method:** Note if ground is covered by vegetation at 10 equidistant points (10 to 100 cms) on metre stick.

Reading 1 \_\_\_\_\_

Reading 2 \_\_\_\_\_

Reading 3 \_\_\_\_\_

Reading 4 \_\_\_\_\_

Reading 5 \_\_\_\_\_

Percent ground cover \_\_\_\_\_

**Theme (2 pts) – Stop 1**

***This question requires you to use materials provided at the stop.***

1) What is the name of the exotic invasive weed labelled T-A that is very common in Manitoba? (0.5pt)

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2) Place a check mark next to the three (3) statements about invasive plants that are TRUE . (1.5 pts - 0.5 pt each)

- \_\_\_ a) Trembling aspen, native to Manitoba, is not an invasive plant.
- \_\_\_ b) They have competitive advantages over other plants.
- \_\_\_ c) They cannot survive through natural disasters such as drought, fire and flooding.
- \_\_\_ d) They cannot be used as forage.
- \_\_\_ e) They are encouraged to establish and spread by disturbance.
- \_\_\_ f) They alter a plant community's ability to provide ecological goods and services.

Team #
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**Wildlife (2 pts) – Stop 1**

Many animals remain active during winter and have evolved to cope with cold temperatures. These cold adaptations (acclimatizations) occur in three categories: behavioral, physiological and anatomical.

1) Choose one of the wildlife species listed below and describe an example of a BEHAVIOURAL adaptation to winter. (1 pt)

Beaver                  Vole                  Grouse

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2) Describe two PHYSIOLOGICAL adaptations of wildlife that are active during winter. (1 pt - 0.5 pt each)

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Page Total
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## **STOP 2**

### **Aquatic Ecology (2 pts) – Stop 2**

1) Which type of lake tends to have better water quality, A or B? \_\_\_\_\_ (0.5 pt)

A. Drainage Lake

B. Seepage Lake

2) A lake is a reflection of its watershed. Name two (2) characteristics of a watershed that can influence a lake. (0.5 pt)

\_\_\_\_\_

\_\_\_\_\_

3) Which has the greater storm water discharge, A or B? \_\_\_\_\_ (0.5 pt)

A. Agricultural Land

B. Forest Land

4) What filters out nutrients in riparian areas? (0.5 pt)

\_\_\_\_\_

### **Forestry (10 pts) – Stop 2**

*This question requires you to use materials provided at the stop.*

1) The two tree cookies provided are from the same tree which was recently cut on this site. Determine the tree's age. Use either sample, and the hand lens and tooth pick if needed. (2 pts)

\_\_\_\_\_

2) Using the Native Trees of Manitoba (provided) or your own general knowledge, identify the native tree samples labelled A through D at this stop. (4 pts - 1 pt each)

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

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

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

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

3) Dendrochronological timelines can be used by researchers to: Circle the best response. (1 pt)

- a) calculate the age of buildings or structures
- b) calculate the age of archeological sites
- c) study the effects of climatic factors on tree growth
- d) all of the above

4) Indicate whether the following statement is true (T) or false (F) by circling the correct answer. (1 pt)

T F Tree ring width can be affected by both biotic and abiotic factors. (1 pt)

5) Which "coniferous species" has the highest merchantable volume in Manitoba? (1 pt)

\_\_\_\_\_

6) Which "deciduous species" has the highest merchantable volume in Manitoba? (1 pt)

\_\_\_\_\_

**Soils and Land Use (2 pts) – Stop 2**

1) List two negative consequences associated with low aggregate stability (1 pt - 0.5 pt each)

\_\_\_\_\_  
\_\_\_\_\_

2) List two factors that affect aggregate stability (1 pt - 0.5 pt each)

\_\_\_\_\_  
\_\_\_\_\_

Team #
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**Theme (2 pts) – Stop 2**

*This question requires you to use materials provided at the stop.*

1) You are given 6 photographs of plant leaves labelled T-A through T-F. Match four (4) of them with the correct description by writing their letter next to the descriptions (2 pts - 0.5 pt each)

- \_\_\_\_ simple, ovate leaf with parallel veins
- \_\_\_\_ pinnately compound leaf with toothed leaflets
- \_\_\_\_ narrow leaf with parallel veins and long, membranous ligule
- \_\_\_\_ simple, lobed leaf with netted veins

**Wildlife (2 pts) – Stop 2**

1) Briefly describe two (2) key roles of the American badger in an ecosystem. (1 pt - 0.5 pt each)

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2) Describe one (1) issue regarding the management of the American badger (i.e., how does it positively or negatively affect human activity). (1 pt)

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Page Total
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**STOP 3**

**Aquatic Ecology (2 pts) – Stop 3**

1) The Province of Manitoba has been promoting a consistent message in regards to what individuals should do with water based equipment to prevent the spread of Aquatic Invasive Species. What is the message? (2 pts)

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ AND \_\_\_\_\_

**Forestry (2 pts) – Stop 3**

1) List 4 signs of forest maturity (old age) that you can find as you look look about this stand. (2 pts - 0.5 pt each)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Soils and Land Use (2 pts) – Stop 3**

1) Soils form and progressively develop under the influence of four soil forming factors acting over time. What are these four factors? (2 pts - 0.5 pt each)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**Theme (2 pts) – Stop 3**

1) Place a check mark next to four (4) statements about Rangeland Condition Assessment and Plant Community Succession that are TRUE. (2 pts - 0.5 pt)

- \_\_\_ a) The climax plant community in a rangeland is dominated by decreaser plant species.
- \_\_\_ b) A rangeland in Fair condition generally is composed of very few increaser plant species.
- \_\_\_ c) Decreaser and invader plant species can both increase as rangelands continue to be overgrazed.
- \_\_\_ d) Plant communities without periodic disturbance evolve towards a climax plant community.
- \_\_\_ e) Rangeland Condition Assessment does not include evaluation of plant community structure, soil stability and exposure, plant litter cover, and noxious weed abundance.
- \_\_\_ f) Plant community succession is an ecological process with components such as disturbance, plant introduction, invasion, establishment, and competition.

**Wildlife (10 pts) – Stop 3**

*This question requires you to use materials provided at the stop.*

1) Refer to the photos labeled W-A, W-B and W-C to answer the following questions (3 pts - 1.5 pts each)

a) Name the organs pictured.

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

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

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

b) What is one (1) function of each of the organs pictured.

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

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

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

2) Birds and mammals share many similar organs but have a few differences in their gastrointestinal system. List two (2) organs found in birds but not mammals and name their functions. (2 pts)

<u>Organ</u>	<u>Function</u>
_____	_____
_____	_____

3) Calculate the dental formula for the skull provided (3 pts)

\_\_\_\_\_

4) The skull provided exhibits specialized dentition in its cheek teeth located on its 4th upper premolar and 1st lower molar. What is the name of this pair of teeth. What is their function? (2 pts)

\_\_\_\_\_

\_\_\_\_\_

**STOP 4**

**Aquatic Ecology (10 pts) – Stop 4**

A farm couple in southwestern Manitoba were having problems providing enough water for their herd during a dry summer. Their dugout pond had gone dry, the flow in a nearby stream had dropped to almost nothing, and the water level in their existing well had dropped significantly. They decided to have a new well drilled to provide a more reliable water supply. Answer the following:

1) Indicate whether the following statement is true (T) or false (F) by circling the correct answer. (0.5 pt)

T F Groundwater is the source for most of the liquid fresh water available on our planet.

2) Approximately what percentage of Manitobans rely on this source for most of their water? Circle the most accurate answer from the choices below. (0.5 pt)

10%                      30%                      50%                      70%                      90%

The drilling company was very busy because of the drought. Older, shallow wells were accessing an unconfined, porous media aquifer that was discharging faster than it could recharge, and many others in the region were having new wells drilled. They now had to drill deeper to reach a confined aquifer.

3) What is an aquifer? (1 pt) \_\_\_\_\_  
\_\_\_\_\_

4) Briefly explain each of the following terms: (3 pts - 1 pt each)

a. groundwater recharge \_\_\_\_\_  
\_\_\_\_\_

b. porous media aquifer \_\_\_\_\_  
\_\_\_\_\_

c. confined aquifer \_\_\_\_\_  
\_\_\_\_\_

Team #
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5) Why might this couple's solution to their water supply problem be only temporary? (1 pt)

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6) Despite being relatively difficult to access, groundwater can become contaminated in various ways. List six (6) common sources of groundwater contamination. (3 pts - 0.5 pt each)

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7) Why do contaminated aquifers often take so long to clean up? (1 pt)

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**Forestry (2 pts) – Stop 4**

Riparian zones are managed through Best Management Practices (BMP's). Circle the best response. (2 pts - 1 pt each)

1) The largest source of pollution entering a watercourse from forest harvesting operations is from:

- a) clearcuts
- b) road construction
- c) animal access
- d) all of the above

Page Total
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2) The BMP principle behind reducing the effects of this sediment is to:

- a) limit harvesting operations in fragile riparian areas
- b) direct waterflow towards undisturbed vegetation
- c) promptly revegetate stream crossings
- d) all of the above

**Soils and Land Use (2 pts) – Stop 4**

1) Soil orders are based on properties that reflect the effects of the dominant soil-forming processes. Name two (2) of the ten soil orders classified by The Canadian System of Soil Classification and provide a brief description of each. (2 pts - 0.5 pt for each order; 0.5 pt for each description)

Order 1: \_\_\_\_\_

Description: \_\_\_\_\_  
\_\_\_\_\_

Order 2: \_\_\_\_\_

Description: \_\_\_\_\_  
\_\_\_\_\_

**Theme (2 pts) – Stop 4**

1) Identify the four (4) rangeland ecological communities within view of this stop. (1 pt)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2) Describe briefly one example of an interaction between any 2 or more ecological communities of rangelands and pasturelands. (1 pt)

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**Wildlife (2 pts) – Stop 4**

*This question requires you to use materials provided at the stop.*

1) Identify the wildlife species by its tracks and signs (2 pts - 0.5 pt each)

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

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

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

W-D \_\_\_\_\_

**STOP 5**

**Aquatic Ecology (2 pts) – Stop 5**

*This question requires you to use materials provided at the stop.*

Note the aquatic sampling device labelled A-A on display at this stop.

1) What is this device designed to sample? (0.5 pt) \_\_\_\_\_

\_\_\_\_\_

2) In which kind of aquatic habitat is this device designed to be used? Circle the best answer below. (0.5 pt)

lake          marsh          pond          stream

3) Why would it not work as well in the other habitats? (1 pt)

\_\_\_\_\_

\_\_\_\_\_

**Forestry (2 pts) – Stop 5**

1) What percentage of forested land is owned by private landowners in Manitoba? Circle the correct response. (1 pt)

- a) 0- 2%
- b) 3 - 5%
- c) 6 - 8%
- d) 9 -11%
- e) 12 - 14%

2) What are small forested areas owned by private landowners called? (1 pt)

\_\_\_\_\_

Team #
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**Soils and Land Use (10 pts) – Stop 5**

*This question requires you to use materials provided at the stop.*

1) Using the hand texturing guide provided at this stop, determine the soil texture of the samples labelled S-A and S-B provided. (2 pts – 1 pt each)

S-A \_\_\_\_\_

S-B \_\_\_\_\_

2) What is the structure of the samples provided? (2 pts - 1 pt each)

S-A \_\_\_\_\_

S-B \_\_\_\_\_

3) Are carbonates present in the samples provided? (2 pts - 1 pt each)

S-A \_\_\_\_\_

S-B \_\_\_\_\_

4) How can one test for carbonates within a field setting? (1 pt)

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5) Using the Munsell colour chart, determine the colour of the sample provided. (1 point)

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6) Does the sample provided contain mottles? (1 pt)

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Page Total
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7) What causes mottles? (1 pt)

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**Theme (2 pts) – Stop 5**

1) Indicate whether each statement is true (T) or false (F) by circling the correct answer. If a statement is false, change it so that it is true. (2 pts)

- T F Less than 1/3 of the original 61.5 million hectares of native grassland remain on the Canadian Prairies
- T F Most land grazed by livestock in Manitoba is tame pastureland because Manitoba has a lot of fertile soil
- T F The largest continuous area of Federal Community Pasture land in Manitoba is 30,000 ha, which is at least 1% of all rangeland and pastureland in this province

**Wildlife (2 pts) – Stop 5**

1) Fill in the blanks. (1 pt - 0.5 pt each)

- a) Primary producers are organisms that use inorganic sources of carbon by consuming other organisms or their by-products. Examples include plants, algae, and certain bacteria. They are also known as \_\_\_\_\_.
- b) Secondary producers are organisms that use organic sources of carbon by consuming other organisms or their by-products. Examples include animals, bacteria and fungi. They are also known as \_\_\_\_\_.

2013 Manitoba Envirothon  
Trail Test

Team #

2) Draw a food chain with four (4) trophic levels. Label the levels. (1 pt)

Page Total

**STOP 6**

**Aquatic Ecology (2 pts) – Stop 6**

*This question requires you to use materials provided at the stop.*

1) Using the Key to Macroinvertebrate Life in the River, identify the invertebrates provided at this stop. Give their common name. (2 pts - 1 pt each)

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

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

**Forestry (2 pts) – Stop 6**

1) Which of the following species is not a 'pioneer' disturbance-dependent species? Circle the correct response. (1 pt)

- a) aspen (*Populus tremuloides* Michx.)
- b) jack pine (*Pinus banksiana* Lamb.)
- c) balsam fir (*Abies balsamifera* (L.) Mill.)
- d) black spruce (*Picea mariana* (Mill.) BSP.)

2) Jack Pine cones are "serotinous". What does that mean? (1 pt)

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**Soils and Land Use (2 pts) – Stop 6**

1) Indicate whether each statement is True (T) or False (F) by circling the correct answer. (2 pts - 0.5 pt each)

- T F A soil survey is an inventory of the soils, their properties and their spatial distribution over a landscape.
- T F A map scale of 1:125,000 provides more detail than a map scale of 1:20,000.
- T F You only need a Generalized soil survey map with a scale of 1:1,000,000 when making site specific decisions at the farm-level.
- T F A 1:20,000 map scale requires 25-30 field inspection sites per section of land.

**Theme (10 pts) – Stop 6**

*This question requires you to use materials provided at the stop.*

1) You are provided with 4 laminated photos of ONE common rangeland plant (labelled T-A, T-B, T-C and T-D), and 1 dichotomous key (labelled T-E). Identify the rangeland plant in the photos using the dichotomous key. If you think you already know what it is, then we recommend that you verify your guess with the dichotomous key (4 pts).

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2) Draw a leaf that is pinnately compound (1 pt).

3) Draw a stem with an alternate branching pattern (1 pt).

Team #
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4) Describe one way that rhizomes are different from stolons (1 pt).

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5) Draw an open panicle of a grass (1 pt)

6) Describe one way that a forb and a grass are different from a shrub (1 pt)

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7) The plant you identified above is a decreaser on rangelands. What does this mean? (1 pt)

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Page Total
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Team #
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**Wildlife (2 pts) – Stop 6**

*This question requires you to use materials provided at the stop.*

1) You are a wildlife technician, and have been collecting data out in the field. All of the data you collected is displayed on the table and has been already labelled. Using this data and the GPS and watch provided, complete your field notes of the day below. (2 pts)

Name of Observers:		
Date:	Time:	GPS Location:
Weather:		
Area Description:		
Collected Items:		

Page Total
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## **STOP 7**

### **Aquatic Ecology (2 pts) – Stop 7**

1) Indicate whether each statement is true (T) or false (F) by circling the correct answer. (2 pts - 0.5 pt each)

- T F Ice is less dense than cold water.
- T F In spring just before the ice melts, water at the bottom of a deep temperate lake will be near 4°C.
- T F Spring turnover in a lake occurs because the water column is not isothermal.
- T F A slow stream tends to be warmer than a fast stream.

### **Forestry (2 pts) – Stop 7**

*This question requires you to use materials provided at the stop.*

The picture, F-A, shows an American elm tree infected with Dutch elm disease.

1) Before you is a wood sample with insect galleries, labelled F-B. The insect present in the galleries is a vector for Dutch elm disease. What is the name of the insect? (1 pt)

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2) Name 2 control measures for Dutch elm disease. (1 pt - 0.5 pt each)

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### **Soils and Land Use (2 pts) – Stop 7**

1) What soil order best completes this sentence? (1 pt)

Most grassland, agricultural soils in Manitoba having a high organic matter in the A horizon are \_\_\_\_\_ soils.

2) Parent materials is the original material from which soils develop. Granite breaks down over time through weathering to produce \_\_\_\_\_ . (1 pt)

**Theme (2 pts) – Stop 7**

*This question requires you to use materials provided at the stop.*

1) You are given an empty bag and 3 samples of forages, harvested from a 0.5m x 0.5m frame in a similar manner as what you see under the grazing cage at this stop. Weigh them and record the masses (g) here. (0.5 pt)

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

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

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

Bag \_\_\_\_\_

2) What is the average mass (g) of the 3 forage samples? Remember to subtract the mass of the empty bag. Show your calculations. (0.5 pt)

3) What is the average forage production ( $\text{g}/\text{m}^2$ )? Show your calculations. (0.5 pt)



4) What is the forage production (kg/ha) of the pasture from where these samples are taken? Show your calculations. (0.5 pt)

**Wildlife (10 pts) – Stop 7**

*This question requires you to use materials provided at the stop.*

Your team is sampling a closed population of voles. Your objective is to estimate the entire population of voles. Individuals are being caught using Sherman live-traps, marked, and released. In the first night of trapping (survey 1), 15 individuals were trapped and marked. Beans are being used to represent individual voles in the population. Voles that have been ‘marked’ are represented by beans marked with a dot.

Shake the container and remove 10 ‘individuals’ (beans). Count how many marked ‘individuals’ are present in the selection and record below. Return the ‘individuals’ to the container and repeat the process 3 more times.

1) Record the number of marked individuals in the chart below: (1 pt)

<b>Trial #</b>	<b># Marked beans in sample</b>
1	
2	
3	
4	

2) Using the Peterson method, calculate the total population size (N) for each trial ( $N=(MC)/R$ ) (4 pts - 1 pt each)

<b>Trial #</b>	<b>Estimated population</b>
1	
2	
3	
4	

3) Calculate the average 'population' of voles (1 pt)

4) The survey is only catching a small number of individuals. Write the adjusted formula that corrects for the small sample size. (2 pts)

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5) Mark-recapture is only one of many methods used to estimate population size. List two other field methods that can be used to estimate animal or plant population size. (2 pts - 1 pt each)

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**STOP 8**

**Aquatic Ecology (10 pts) – Stop 8**

*This question requires you to use materials provided at the stop.*

1) Perform the water quality test and record the amount of phosphate you determined is present in Lake Udall. (4 pts)

***Directions:***

- Remove your sunglasses and put on the safety gloves and goggles.
- Follow the instructions on the laminated card labelled Phosphate (reverse side of colour chart) as outlined below:
- Wait 5 minutes. **CONTINUE WITH QUESTIONS 2-5 WHILE WAITING.**
- Compare the colour of the sample in the test tube to the Phosphate Colour Chart on the reverse side of the laminated instruction card.

Record the result in ppm the space below. If the colour of your treated sample is in between colours on the chart, report your result halfway between the two corresponding numbers.

The amount of phosphate in Lake Udall is \_\_\_\_\_ ppm.

2) Phosphate is a typical chemical to measure during water quality monitoring. (1 pt - 0.5 pt each)

a) What does the abbreviation ppm stand for? (0.5 pt)

\_\_\_\_\_

b) Over which level does phosphate contribute to increased plant and algal growth?  
Circle the correct answer. (0.5 pt)

0.03 ppm    0.3 ppm    1 ppm    3 ppm

3) Lakes can be classified according to their trophic state. For each of the given classifications, enter the letter of the correct definition from the list below. (1.5 pts - 0.5 pt each)

Classifications

Definitions

Eutrophic \_\_\_\_\_

A. Lake with low nutrients and low plant growth.

Oligotrophic \_\_\_\_\_

B. Lake with moderate nutrients and moderate plant growth.

Mesotrophic \_\_\_\_\_

C. Lake with high nutrients and high plant growth.

4) Phosphorus is an essential element to plant and animal life, and cycles through the aquatic ecosystem. (3 pts - 1 pt each)

a) Where does phosphorus occur naturally on land?

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b) In the aquatic ecosystem what can absorb the phosphorus ions directly?

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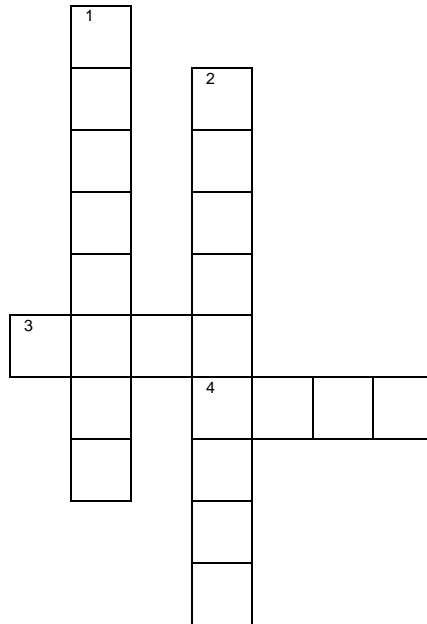
c) What is a source of excess phosphorus from rangeland or pastureland?

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5) What is the condition called that results when too many plants die and decompose in a water body and deplete the dissolved oxygen in the water? (0.5 pt)

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**Forestry (2 pts) – Stop 8**



**Down:**

- 1) Trees and shrubs are important in a \_\_\_\_\_ area because they help stabilize banks, absorb nutrients, and provide shade. (0.5 pt)
- 2) Trees generally \_\_\_\_\_ the largest amount of carbon during the first 60-100 years of growth. (0.5 pt)

**Across:**

- 3) \_\_\_\_\_ and large browsing animals were historically the natural control for trembling aspen on the grasslands. (0.5 pt)
- 4) Any standing dead, partially dead, or defective tree at least three meters tall (often a source of wildlife habitat). (0.5 pt)

**Soils and Land Use (2 pts) – Stop 8**

1) Nitrogen fertilizer is converted to \_\_\_\_\_ by microorganisms in the soil and can be taken up by plants. (1 pt)

2) What are two benefits of soil testing related to nitrogen fertilizer use? (1 pt - 0.5 pt each)

\_\_\_\_\_

\_\_\_\_\_

**Theme (2 pts) – Stop 8**

*This question requires you to use materials provided at the stop.*

1) You are given 6 photographs of grass inflorescences labelled T-A through T-F. Match four (4) of them with the correct description by writing their letter next to the descriptions (2 pts - 0.5 pt each)

- \_\_\_\_\_ spike-like panicle with >20 spikelets, having florets with indistinct awns
- \_\_\_\_\_ spike containing 10-20 spikelets, having florets and glumes with long awns
- \_\_\_\_\_ panicle of 2 to 4 one-sided racemes, each containing numerous hairy spikelets with awn-tipped glumes and florets
- \_\_\_\_\_ open panicle with >20 spikelets, having lemmas with distinct awns and hairs

**Wildlife (2 pts) – Stop 8**

*This question requires you to use materials provided at the stop.*

1) Using the field guide provided, identify the two bird species labelled W-A and W-B.

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

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

**STOP 9**

**Aquatic Ecology (2 pts) – Stop 9**

*This question requires you to use materials provided at the stop.*

Note the bathymetric map of nearby Lake Udall, provided on the table. Each contour line superimposed on the satellite photo represents a one metre depth change from an adjacent contour line. Based on this map, answer the following questions:

1) Which of the marked positions (A, B, C, or D) on the map identifies the location of the deepest point in the lake? (0.5 pt)

A                      B                      C                      D

2) Circle the value, below, that best represents the maximum depth of this lake: (0.5 pt)

1.3 metres      2.3 metres      3.3 metres      4.3 metres      5.3 metres

3a) Would you expect to find a thermocline in this lake on a breezy day in mid-summer? (0.5 pt)

yes                      no

3b) Why, or why not? (0.5 pt)

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**Forestry (2 pts) – Stop 9**

List four (4) elements of a Pre Harvest Assessment or Survey. (2 pts – 0.5 pt each)

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**Soils and Land Use (2 pts) – Stop 9**

1) Tile drains can be an effective means of lowering a water table in order to protect crops. However, it is not uncommon for concerns to be raised regarding problems created by their implementation. Explain why the implementation of tile drains may actually not create the two problems listed below. (2 pts - 1 pt each):

a) Increasing downstream flooding

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b) Over-draining and drying out the soil

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**Theme (10 pts) – Stop 9**

*This question requires you to use materials provided at the stop.*

You are assigned to write the report for the rangeland health assessment of a rangeland. You have on your desk the following materials (labelled T-A through T-I).

- species composition of the rangeland (T-D)
- the expected reference plant community species composition (T-E)
- a written account of observations of the rangeland (T-F)
- 2 photographs of the extent of leafy spurge coverage on the rangeland (T-A and T-B)
- 1 photograph representing the soil exposure on the site (T-C)
- the table of Rangeland Health Assessment Litter Thresholds (T-G)
- diagram of Percent Cover examples (T-H)
- table of Density Distribution (T-I)



1) By comparing the species composition of the rangeland (T-D) and the reference plant community (T-E), select the best score for plant community composition (1 pt).

- 24 Rangeland community closely resembles reference plant community
- 16 Rangeland community shows a small amount of change from reference plant community
- 8 Rangeland community shows clear change from the reference plant community
- 0 Rangeland community shows almost no resemblance to the reference plant community

2) From the written account of observations of the rangeland (T-F), how would you score the structure and function of the rangeland? (1 pt)

- 6 All structural and functional groups are present in full amounts
- 4 One structural and functional group is missing or significantly reduced
- 2 Two structural and functional groups are missing or significantly reduced
- 0 Three or more structural and functional groups are missing or significantly reduced

3) From the written account of observations of the rangeland (T-F), determine the average amount of plant litter covering the soil (pounds per acre – lbs/ac). (1 pt)

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4) From your calculation above, and the table of Litter Thresholds (T-G), how would you score the site's ability to protect the soil and retain moisture? (1 pt)

- 15 Average plant litter amounts are greater than 65% of normal
- 8 Average plant litter amounts are between 35% and 65% of normal
- 0 Average plant litter amounts are less than 35% of normal

5) From the written account of observations of the rangeland (T-F), and the photograph of the soil exposure (T-C), how would you score soil stability? (2 pt)

- 9 less than 10% of the area is unnaturally exposed soil and there is no erosion
- 7 less than 10% of the area is unnaturally exposed soil but only a little evidence of erosion
- 6 10% to 20% of the area has unnaturally exposed soil but only a little evidence of erosion
- 3 20% to 50% of the area has unnaturally exposed soil and erosion is moderate
- 0 Over 50% of the area has unnaturally exposed soil and erosion is extreme

6) If all of the yellow in the photographs labelled T-A and T-B is leafy spurge, an invasive weed, how would you score the weed risk of the rangeland? Use the Percent Cover Examples (T-H) and the Density Distribution Table (T-I) to help you. (2 pt)

- 6 no weeds
- 4 less than 1% cover of weeds with a weed distribution score of 2
- 3 less than 1% cover of weeds but a weed distribution score of 1
- 2 between 1% and 15% cover of weeds and a weed distribution score of 0
- 0 more than 15% cover of weeds and a weed distribution score of 0

7) If you total all 5 of the health question scores above, what rangeland health category does this rangeland fall into? Circle one. (1pt)

- Healthy (45 or greater)
- Healthy with Problems (30-44)
- Unhealthy (less than 30)

Team #
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8) Put a checkmark beside the appropriate interpretation and management recommendation for this rangeland as a result of your assessment. (1 pt)

- a) The assessment indicates that ecological functions are not working well, but could recover within only a few years if rangeland management practices are adjusted.
- b) The assessment indicates that ecological functions are performing well. Current rangeland management practices are sustainable and should be continued.
- c) The assessment indicates that ecological functions are performing well. There is no longer a need to stock conservatively and practice rotational grazing.
- d) The assessment indicates that ecological functions are significantly altered. Urgent change in management practices is needed, but it will be several years before the site is functioning at full capacity.

**Wildlife (2 pts) – Stop 9**

1) As species invade new territories, the world becomes more alike in terms of biology. This process is called \_\_\_\_\_. (0.5 pt)

2) Invasive species are successful due to some advantage they have over native species. List 3 of these possible advantages. (1.5 pts - 0.5 pt each)

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Page Total
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**STOP 10**

**Aquatic Ecology (2 pts) – Stop 10**

*This question requires you to use materials provided at the stop.*

1) One of the practices identified in the Theme question at this stop is the installation of a pipeline, pump and storage tank to supply water to troughs in the upland areas. This practice is used to minimize the amount of time cattle spend in riparian areas and streams. Under Section 30 of the Federal Fisheries Act, it is a requirement to provide end-of-pipe screens when withdrawing water from fish bearing waters. This is to prevent potential losses of fish. Looking at the Guideline provided, list the two ways fish can be lost when extracting water. (1 pt - 0.5 pt each)

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2) The stream you are planning to withdraw water from has a resident population of brook trout. Based on the swimming mode of the fish determined from Table 1 (page 5), use Figure 1 (page 9) to determine what open screen area (in m<sup>2</sup>) is required if withdrawing water at a rate of 60 L/s? (0.5 pt)

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3) Measure the larval fish provided at this stop. Would these guidelines protect this lifestage? (0.5 pt)

yes                      no

**Forestry (2 pts) – Stop 10**

*This question requires you to use materials provided at the stop.*

The forestry equipment at this stop (labelled F-A) is a pheromone trap used to detect/trap adult male gypsy moth, an invasive species to North America. Finding a large number of gypsy moths in the traps can indicate moth activity in a given area and lead to management measures.

1) In which life stage does the European gypsy moth do the most damage to trees? (0.5pt)

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Team #
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2) Why are frequent infestations of gypsy moth hard on trees? (0.5 pt)

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3) In 2009, Manitoba carried out a management plan to eradicate new detections of gypsy moth found in 2008. Was the province successful in its eradication efforts at this time? (0.5 pt)

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4) What affects to human health can gypsy moth cause? (0.5 pt)

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**Soils and Land Use (2 pts) – Stop 10**

1) List the four conditions that, when occurring together, cause salinization on the soil surface. (2 pts - 0.5 pt each)

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Page Total
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**Theme (2 pts) – Stop 10**

*This question requires you to use materials provided at the stop.*

1) You are provided a laminated card with the Four Grazing Management Principles (labelled T-A). These principles help rangeland and pastureland managers to determine beneficial management practices for the land. Place the letter of the principle next to the practice below that each livestock producer is using to sustainably manage rangeland or pastureland. (2 pt - 0.5 pt each)

\_\_\_\_\_ A sheep farmer divides her rangeland into 5 fields and grazes her sheep in only one of the fields each month. At any time, 4 of the fields are not being grazed.

\_\_\_\_\_ A beef producer uses the carrying capacity guideline found in a book about rangeland communities to calculate how many cow-calf pairs can graze in his rangeland fields.

\_\_\_\_\_ A Community Pasture Manager divides one field into two parts and doesn't graze the second part until a few weeks after the western spiderwort (a rare plant that flowers in May and June) in that field has flowered and gone to seed.

\_\_\_\_\_ A rancher installs a pipeline, pump, and storage tank to supply river water in a trough on the uplands, hoping that the cattle will spend more time up there than in the riparian area next to the river.

Team #
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**Wildlife (10 pts) – Stop 10**

*This question requires you to use materials provided at the stop.*

1) Identify the furs laid out before you. (8 pts - 1 pt each)

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

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

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

W-D \_\_\_\_\_

W-E \_\_\_\_\_

W-F \_\_\_\_\_

W-G \_\_\_\_\_

W-H \_\_\_\_\_

2) Identify the two skulls using the provided plates. (2 pts - 1 pt each)

W-I \_\_\_\_\_

W-J \_\_\_\_\_

Page Total
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**STOP 11**

**Aquatic Ecology (10 pts) – Stop 11**

*This question requires you to use materials provided at the stop.*

Using the supplied collection bottle, obtain a sample of water from nearby Lake Udall. Return to the filtration apparatus on the table and carefully install a new filter in the funnel. Only particles smaller than 1 micron (1 micrometre) will pass through this filter. Filter 100 ml of raw lake water through the new filter, then carefully remove the filter from the funnel and examine it for signs of residue. Compare this filter to the filter on display from the Red River, and answer the following questions:

1) How does the water in the filter flask differ from the raw lake water? (1 pt)

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2) Examine the following list of things that might be found in the raw water. Circle the best answer, to the right of each item, to indicate whether that item would most probably be found on the filter, in the filtrate, or in both places, following filtration of the raw water.

(4 pts - 0.5 pt each)

a) algal cells	on filter	in filtrate	both places
b) total phosphorus	on filter	in filtrate	both places
c) dissolved inorganic carbon	on filter	in filtrate	both places
d) aqueous ammonia	on filter	in filtrate	both places
e) zooplankton	on filter	in filtrate	both places
f) dissolved oxygen	on filter	in filtrate	both places
g) viruses	on filter	in filtrate	both places
h) sand grains	on filter	in filtrate	both places

3) Lake Udall and the Red River are very different aquatic systems. List two (2) contrasting aspects of these ecosystems that help to explain why the residue on your filter and the residue on the display filter from the Red River are so different. (2 pts - 1 pt each)

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Team #
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4) A Secchi depth reading taken earlier in the Red River in Winnipeg measured 0.2 metres. In what way does the amount and type of residue on the filter relate to what a Secchi depth is measuring? (2 pts)

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5) What natural substances that pass into the filtrate can also affect the depth reading taken with a Secchi disk? (1 pt)

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**Forestry (2 pts) – Stop 11**

1) What is forest certification? ( 2 pts)

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Page Total
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**Soils and Land Use (2 pts) – Stop 11**

*This question requires you to use materials provided at the stop.*

A 150 g dried soil sample contains the following:

10 g organic matter  
60 g clay  
15 g sand

1) What percentage of the soil is silt? (1 pt)

2) What is the texture? (1 pt)

---

**Theme (2 pts) – Stop 11**

In a Twice-Over Grazing System, the first livestock rotation uses  $\frac{1}{3}$  of the available forage supply and the second rotation uses the remaining  $\frac{2}{3}$ . An example grazing unit is 65 ha in size, with three fields of equal size and forage productivity. This grazing unit supplies 1300 kg/ha of available forage.

1) How many kilograms of available forage are supplied in the first rotation by the entire grazing unit? Round to the nearest kilogram. (0.5 pt)

2) If 120 days of grazing are needed, how long do you expect the entire first rotation to take? Round to the nearest day. (0.5 pt)

3) How many days will the livestock spend in EACH FIELD of the grazing unit during the second rotation? Round to the nearest day. (0.5 pt)

4) How many days of total rest does each field receive during the 120 day grazing period? Round to the nearest day. (0.5 pt)

**Wildlife (2 pts) – Stop 11**

1) In the Canadian prairies, what type of bird has had the highest population increase from 1970-2010? Circle the correct answer. (0.5 pt)

- a) Forest Birds
- b) Waterfowl
- c) Grassland Birds
- d) Other water birds

2) In the Canadian prairies, what type of bird has had the highest population decrease from 1970-2010? Circle the correct answer. (0.5 pt)

- a) Forest Birds
- b) Waterfowl
- c) Grassland Birds
- d) Other water birds

3) What is the reason for population fluctuation in waterfowl and other water birds from year to year? (1 pt)

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**STOP 12**

**Aquatic Ecology (2 pts) – Stop 12**

*This question requires you to use materials provided at the stop.*

1) Look at the 3 photos of aquatic plants labelled A-A, A-B and A-C. Place the plants in order of occurrence starting from the shoreline. (1.5 pts - 0.5 pt ea)

\_\_\_\_\_

2) What is the aquatic area near the shore called? (0.5 pt)

\_\_\_\_\_

**Forestry (2 pts) – Stop 12**

1) With regards to Manitoba's forest renewal and tree planting programs, what is a "snow cache"? (1 pt)

\_\_\_\_\_  
\_\_\_\_\_

2) Define "silviculture." (1 pt)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Soils and Land Use (2 pts) – Stop 12**

1) A soil has the following characteristics: a platy structure, a high bulk density, and a restricted rooting zone with evidence of flattened and turned plant roots. What term best describes the condition of this soil? (1 pt)

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2) What factors likely caused this soil condition to develop? List two (2). (1 pt - 0.5 pt each)

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**Theme (10 pts) – Stop 12**

*This question requires you to use materials provided at the stop.*

M. LaFleche has a grazing unit divided into 3 fields. One is tame pastureland on loamy soil and two are native rangeland on sandy soil. He has made a long-term plan to stock 55 replacement heifers (1-2 year old female cattle) for 5 months each year, along with 2 mature bulls for 3 months each year. He is asking you if his grazing plan has the right number of livestock to balance environmental benefits and economic production.

You put range cages in each of his fields, and take forage samples from them at the end of the growing season. It is an average year for temperature and precipitation. Each of your 3 vegetation samples (3 bags of forage) are representative of the vegetation in each field from which they come.

1) Use the information on each of the 3 bags to determine the total forage production (kg) of each field. Show your calculations for each field. (2 pts)

Field A:

Field B:

Field C:

2) The safe use factor for native sandy rangelands is 35% (or 0.35) and for tame loamy pasturelands it is 70% (or 0.70). Use these factors and what you know about total forage production (kg) in each field to determine the available forage supply in each field (kg). Show your calculation for each field. (2 pt)

Field A:

Field B:

Field C:

3) What is the total available forage supply (kg) for the entire grazing unit? Show your calculation. (1 pt)

4) Use the information in the laminated Table of Animal Unit Equivalents (labelled T-A) to convert the total available forage supply from measurement in kg to measurement in animal unit months AUM. (1 pt). Show your calculation.

5) Use the livestock and grazing period information from M. LaFleche's plan, and information in the Table of Animal Unit Equivalents (labelled T-A) to calculate the total demand for forage by livestock (measurement in animal unit months - AUM). Show your calculations. (2 pt)

Heifers:

Bulls:

Total:

6) How does available forage supply compare to forage demand by livestock? Is there extra or not enough forage in this grazing plan? Show your calculations. (1 pt.)

7) How many heifers would you recommend that M. LaFleche add or remove to balance his grazing plan? Show your calculation. (1 pt)

**Wildlife (2 pts) – Stop 12**

*This question requires you to use materials provided at the stop.*

1) Identify the four wildlife species whose calls are played (2 pts - 0.5 pt each)

a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_



## **STOP 13**

### **Aquatic Ecology (2 pts) – Stop 13**

*This question requires you to use materials provided at the stop.*

Examine the collage of photos from Lake Winnipeg labelled A-A on display at this stop.  
Answer the following:

1) What term is used by aquatic ecologists to describe the condition illustrated in these photos?  
(0.5 pt)

---

2) What scientific name is given to the particular group of aquatic organisms that are causing this condition? (0.5 pt)

---

3) What chemical element has been shown to be the primary factor in permitting this condition to develop in lakes? (0.5 pt)

---

4) From the following list, circle the answer that best describes the source of the excess amounts of this chemical reaching Lake Winnipeg. (0.5 pt)

- a) Urban sewage
- b) Agricultural runoff
- c) Lawn fertilizers
- d) All of these sources

**Forestry (10 pts) – Stop 13**

*This question requires you to use materials provided at the stop.*

1) Using the Suunto and Diameter Tape provided, measure the trees indicated. Record your measurements in the spaces provided. Using the volume table provided, calculate the trees' volume.

Tree A:

Diameter (dbh): \_\_\_\_\_ cm (2 pts)

Height (h): \_\_\_\_\_ m (2 pts)

Volume: \_\_\_\_\_ (m<sup>3</sup>) (0.5 pt)

Tree B:

Diameter (dbh): \_\_\_\_\_ cm (2 pts)

Height (h): \_\_\_\_\_ m (2 pts)

Volume: \_\_\_\_\_ (m<sup>3</sup>) (0.5 pt)

2) Indicate which tree has more total volume. (1 pt)

Largest Volume: \_\_\_\_\_

**Soils and Land Use (2 pts) – Stop 13**

1) Fill in the blanks with the correct terms. (1 pt - 0.5 pt each)

Available water capacity (AWC) is water held in soil between two other measures of the amount of water in soil: \_\_\_\_\_ and \_\_\_\_\_.

2) List two soil properties that affect AWC. (1 pt - 0.5 pt each)

\_\_\_\_\_  
\_\_\_\_\_

**Theme (2 pts) – Stop 13**

*This question requires you to use materials provided at the stop.*

1) You are presented with images of 4 rangeland users. Name one thing that each of these users needs from rangelands. (2 pt - 0.5 pt each)

T-A Consumers of food and water \_\_\_\_\_

T-B ATV rider \_\_\_\_\_

T-C Sheep producer \_\_\_\_\_

T-D Indigenous peoples \_\_\_\_\_

**Wildlife (2 pts) – Stop 13**

1) Which of the following parasites uses a predator-prey relationship (i.e. transmitted through a food web) to move from one host to another. Circle the correct response. (0.5 pt).

- a) white-nose syndrome
- b) echinococcus
- c) lyme disease
- d) giardia

2) List a predator-prey relationship that would complete this parasite's life cycle (1 pt)

\_\_\_\_\_

3) How could this parasite affect a prey's ability to escape a predator? (0.5 pt)

\_\_\_\_\_

\_\_\_\_\_

## **STOP 14**

### **Aquatic Ecology (2 pts) – Stop 14**

1) What percentage of the air we breathe is nitrogen? Circle the correct answer. (0.5 pt)

20%                      40%                      80%                      90%

2) In most ecosystems where is nitrogen primarily stored? (0.5 pt)

---

3) What is the name of the process that returns nitrate from a water body back to the atmosphere? (0.5 pt)

---

4) Why do levels of nitrogen typically decrease in the epilimnion of a lake throughout the summer? (0.5 pt)

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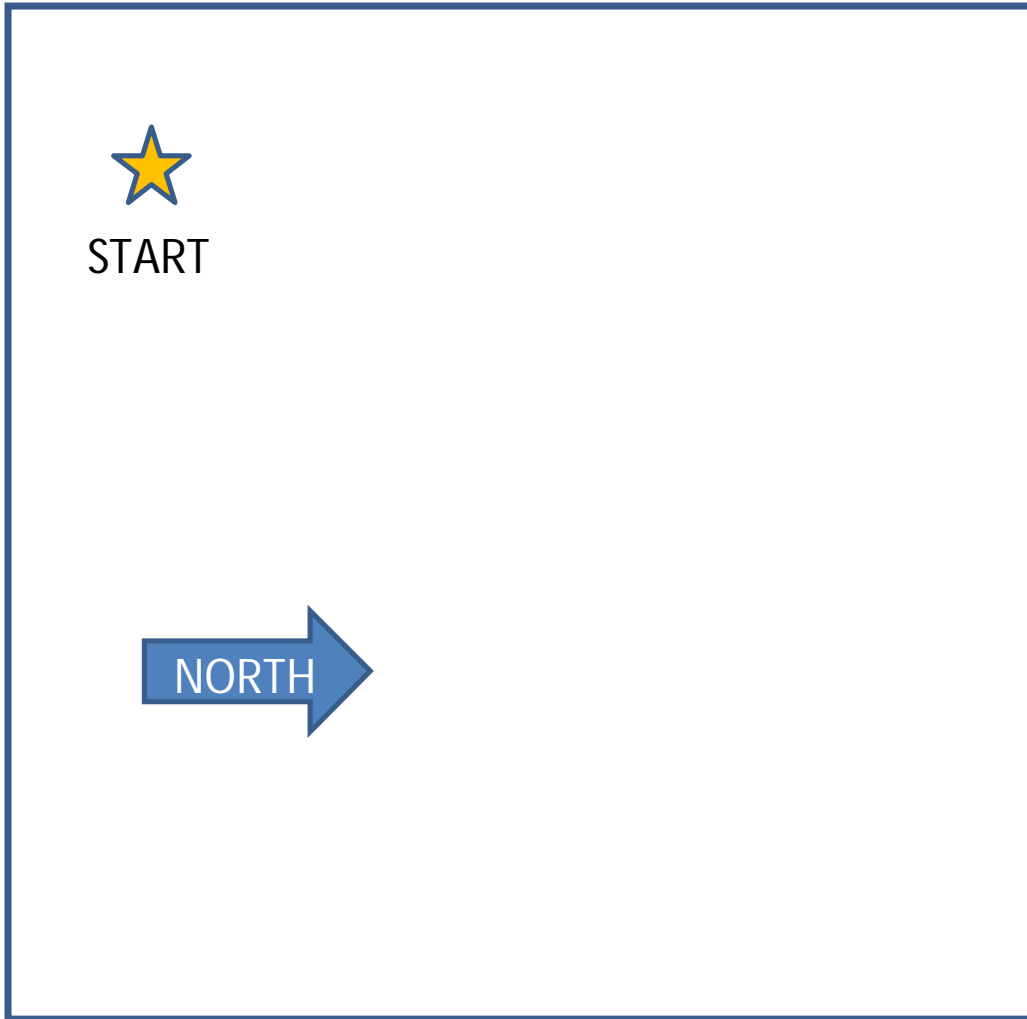
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### **Forestry (10 pts) – Stop 14**

***This question requires you to use materials provided at the stop.***

You are on Turtle Mountain. This region is the oldest inhabited part of the province, since it was the first dry land that appeared after the glacial period over 12,000 years ago. You have been asked to survey this site for a forestry company and to indicate, on a map, any evidence of traditional land use by aboriginal people, examples of non-timber forest products sources, and any signs of insects or disease in the plot. Visit the flagged sites marked A to E at this stop to complete a map of the site.

1) Mark the locations of the five (5) flags, A to E, on the map provided below. (2.5 pts - 0.5 pt each)



2) Label the three (3) flags on the site that are examples of non-timber forest products as “NTFP” on the map. (3 pts - 1 pt each)

3) Label the one (1) on the site that is an example of traditional land use as “TLU” on the map. (0.5 pt)

Team #
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4) On behalf of the forestry company you will be meeting with a First Nation community that has a history of using this area. List three (3) examples of traditional land use that might be mentioned by community members. (3 pts – 1 pt each)

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5) While performing the survey you also notice the disease pictured in the photo labelled F-A. Identify this disease. (1 pt)

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**Soils and Land Use (2 pts) – Stop 14**

*This question requires you to use materials provided at the stop.*

1) Locate 25-3-20W on the map provided.

a) What is the dominant soil series in this section? Provide the full name. (0.5 pt)

---

b) What is the dryland capability for agriculture for this series (0.5 pt)

---

2) As you walk the trail, you should notice limitations to agriculture. Name one subclass limitation to agriculture for these soils on the trail. (1 pt)

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Page Total
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**Theme (2 pts) – Stop 14**

*This question requires you to use materials provided at the stop.*

1) You are given 4 cards with grass biological characteristics (labelled T-A, T-B, T-C and T-D). Place the letter of the description after the appropriate type of grass. (2 pts - 0.5 pt each).

C3 (cool season grasses): \_\_\_\_\_

C4 (warm season grasses): \_\_\_\_\_

**Wildlife (2 pts) – Stop 14**

1) Red fox are important mesopredators (e.g., secondary or tertiary consumers) commonly found in pasturelands. However, red fox are often considered a nuisance to ranchers, and are often the target of removal efforts. (2 pts - 1 pt each)

a) What are two (2) ways red fox positively benefit the pastureland?

\_\_\_\_\_

\_\_\_\_\_

b) What are two (2) ways red fox negatively affect the pastureland?

\_\_\_\_\_

\_\_\_\_\_

**STOP 15**

**Aquatic Ecology (2 pts) – Stop 15**

*This question requires you to use materials provided at the stop.*

1) Using the Key to Common Manitoba Fish Species provided at this stop, identify the fish by its common name. (1 pt)

---

2) The species identified above is considered a **planktonic** / **benthic** organism. Circle the appropriate answer. (0.5 pt)

3) What external feature assisted you in determining your answer for part 2? (0.5 pt)

---

**Forestry (2 pts) – Stop 15**

*This question requires you to use materials provided at the stop.*

1) Is the tree identified with flagging tape vulnerable to attack by the insect labelled F-A? (0.5 pt)

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2) Name the insect labelled F-A. (0.5 pt)

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3) List 2 signs of infection that a tree that is vulnerable to attack will display if this insect is present. (1 pt - 0.5 pt each)

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**Soils and Land Use (10 pts) – Stop 15**

*This question requires you to use materials provided at the stop.*

1) Using the Canadian System of Soil Classification (CSC) provided and your own knowledge, answer the following questions about the soil at this stop (Hint: Not a Podzol).

a) Soil Order (2 pts)

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b) Great Group (2 pts)

---

c) Subgroup (2 pts)

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d) What is the depth of the A horizon? (1 pt)

---

e) What is the structure of the A horizon? (1 pt)

---

2) Excess levels of phosphorus in surface water can result in \_\_\_\_\_ (name the term) (1 pt)

3) Phosphorus is not very mobile in the soil because it binds to two elements. Name these elements. (1 pt - 0.5 pt each)

\_\_\_\_\_ & \_\_\_\_\_

Team #
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**Theme (2 pts) – Stop 15**

1) Indicate whether each statement is true (T) or false (F) by circling the correct answer. If the statement is false, change it so it is true (2 pt).

- T F Cattle and elk have compatible diets, so elk benefit from using the same rangeland and pastureland as cattle.
- T F Sprague's pipit and some sparrows prefer rangelands that are grazed by cattle instead of rangelands which cattle do not use.
- T F Because they are different species, cattle, deer, elk, sheep and goats cannot receive the same disease pathogens.

**Wildlife (2 pts) – Stop 15**

1) Name two (2) problem wildlife species found in Manitoba. Provide an example of why each is designated as such. (2 pts - 0.5 pt each species, 0.5 pt each example)

Problem Species 1: \_\_\_\_\_

They are considered a problem species because: \_\_\_\_\_

\_\_\_\_\_

Problem Species 2: \_\_\_\_\_

They are considered a problem species because: \_\_\_\_\_

\_\_\_\_\_

Page Total
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