

THE ARCADE TRAIL

STOP 1

AQUATIC ECOLOGY (2 points)

- a. Refer to the aquatic invasive specimen displayed in the vial at this stop. What is the common name of this aquatic invasive specimen, which can now be found in Manitoba? (0.5 pt)

- b. Name one (1) other aquatic invasive species in Manitoba. (0.5 pt)

- c. What is one (1) advantage that invasive species have over native species when introduced into a new environment? (1 pt)

Answer:

- a. *Spiny waterflea*
- b. *Any of the following:*
 - *rusty crayfish*
 - *common carp*
 - *white bass*
 - *rainbow smelt.*
- c. *Any of the following:*
 - *No natural predators*
 - *no natural competitors*
 - *no natural disease.*

Reference:

Aquatic Resources - AIS brochure

FORESTRY (10 points) **EQUIPMENT**

Using the equipment provided at this stop, you will measure the marked trees in this “Permanent Sample Plot” which has been measured over the last 40 years. You will record the information gathered in the correct places on the tally sheet and plot the results on the

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chart provided. Please ensure your team number is marked on the tally sheet and chart and it is returned with the rest of your test!

- a. Using the equipment provided at this stop, measure the tagged trees and place your measurements on the tally sheet provided.

Height Tree A: _____ (2 pts)

Diameter Tree A: _____ (2 pts)

Diameter Tree B: _____ (2 pts)

- b. Using the information collected in (a.), plot the results on the chart provided. (1 pt – 0.5 pt each)

- c. Circle the best response. Regarding the growth rates of the two (2) trees after the 2011 measurements, Tree 'A' is: (1 pt)

- i. slowing down more quickly than Tree "B"
- ii. slowing down more slowly than Tree "B"
- iii. slowing down at the same rate as Tree "B"

- d. What are two (2) main purposes of a Permanent Sample Plot? (2 pts - 1 pt each)

1. _____

2. _____

Answer:

- a. **TBD** (6 pts)
- b. **TBD** (1 pt)
- c. ii. (1 pt)
- d. Any two of the following: (1 pt each)
- to calculate tree growth
 - track forest and stand development
 - assess health and stresses on forest
 - quantify volume and growth rates
 - ensure renewal standards are being achieved.

Reference:

Workshop Training

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SOILS AND LAND USE (2 points)

Use the data provided below to calculate the bulk density of the soil. Include appropriate units in your response.

Volume of soil = 89 cm³

Mass of empty graduated cylinder = 221 g

Mass of graduated cylinder + soil = 337 g

Answer:

Mass of soil = 337-221

Volume of soil = 89

Bulk density of the soil is 1.3 g/cm³. (2 pts)

Reference:

Soil Management Guide, p. 14

WILDLIFE (2 points)

- a. What do beluga whales eat? (1 pt)

- b. What type of ecosystem do beluga whales gather in large numbers to feed in during the summer? (1 pt)

Answer:

a. Fish OR Arctic cod (1 pt)

b. estuaries (1 pt)

Reference:

Wildlife Document p. 102, 119

Wildlife Training Session

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

Fill in the blanks by choosing the appropriate term provided in parentheses. (0.5 pt each)

If an estuary is deep enough, the saltwater from the sea will pass _____ (**under / over top of**) the freshwater while the freshwater going down the river will stay _____ (**above / below**) the saltwater layer and enter the sea. This is called a _____ (**salt-wedge / fjord / slightly stratified / vertically mixed**)

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estuary. This kind of estuary tends to form in situations with low turbulences; therefore,
_____ (very little / a lot of) mixing occurs.

Answer:

In order: under; above; salt-wedge, very little (0.5 pt each)

Reference:

Fresh and Saltwater Estuaries: Material for Canon Envirothon, p. 4

STOP 2

AQUATIC ECOLOGY (10 points) **EQUIPMENT**

Examine the two (2) photographs on display at this stop of Lake Winnipeg taken from satellites in late summer, 2009. Several key locations around the lake are identified on the photos and the date of the photography is printed on each photo. Notice how the surface colour of the lake varies in these photos. These colour differences are indicative of differing water quality in different regions within the large lake, and at different times. Notice in particular, the change in the northeast section of Lake Winnipeg between August 31 and September 2.

Based on your understanding of what is illustrated in these photographs, fill each of the blanks in the following narrative with the most correct term selected from the list provided below. Each term should be used only once. (1 pt for each correct term)

Much of the light brown colour visible, particularly in the southern part of Lake Winnipeg, can be attributed to _____ washed into the lake by the Red and other rivers draining prairie farmlands.

The green colour visible in the northeast region (circled) of Lake Winnipeg on September 2, 2009, indicates the presence of a

_____ of _____ or _____ that had developed rapidly since the previous photo was taken on August 31.

These organisms are capable of rapid growth whenever environmental conditions are suitable. Such conditions include warm water with light winds and sunshine. This rapid

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growth also requires an excess of _____ in the lake water.

Under such conditions, these organisms can float at or near the surface, capturing available _____ and multiplying rapidly. Scientists refer to this entire phenomenon as _____.

Under certain conditions, some species of these organisms can release _____ into the water, creating a hazard for other species using the lake, including humans. When large masses of these short-lived organisms die off, _____ by bacteria often leads to reduced concentrations of _____ in the lake water and fouling of beaches along the lake shores.

sunlight

phosphorus

blue-green algae

decomposition

dissolved oxygen

eutrophication

suspended clay particles

surface bloom

cyanobacteria

toxic substances

Answer:

The correct order of the supplied terms is: 1. suspended clay particles, 2. surface bloom, 3. blue-green algae, 4. cyanobacteria, 5. phosphorus, 6. sunlight, 7. eutrophication, 8. toxic substances, 9. decomposition, 10. dissolved oxygen (1 pt each)

Reference:

<http://lakes.chebucto.org/eutro.html>

<http://lakes.chebucto.org/cyano.html>

<http://www.cedareden.com/micro/blooms.html>

FORESTRY (2 points)

EQUIPMENT

- a. Refer to the flagged samples at this stop. What is the term for the damage on the marked seedlings? (1 pt)

- b. What do you think did this damage? (1pt)

Answer:

a. Browse (1 pt)

b. white-tailed deer (1 pt)

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Reference:

Workshop Training; Common knowledge

SOILS AND LAND USE (2 points)

EQUIPMENT

Refer to the soil sample provided at this stop.

- a. What are the rust-coloured spots in the subsoil called? (1 pt)

- b. Under what conditions are these rust-coloured spots formed? (1 pt)

Answer:

- a. *Mottles (1 pt)*
- b. *Alternating wetting and drying conditions (1 pt)*

Reference:

Soil Management Guide, p. 15

WILDLIFE (2 points)

List two (2) adaptations woodland caribou have developed in order to survive in their habitat, and explain how each adaptation is useful to caribou. (1 pt each)

1. _____

2. _____

Answer:

Any two of the following (1 pt each):

- *Hollow hairs provide buoyancy and extra insulation*
- *Flexible hooves for quick travel over tundra and snow, and for swimming*
- *Herding behaviour for protection*

Reference:

Wildlife Document, p.38-39

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THEME: FRESH AND SALT WATER ESTUARIES (2 points)

Define each term below. (0.5 pt each)

Anthropogenic – _____

Benthos – _____

Eutrophication – _____

Sedimentation – _____

Answer:

Anthropogenic: effects arising from human activity (0.5 pt)

Benthos: bottom-dwelling flora and fauna (0.5 pt)

Eutrophication: a significant increase in the concentration of nutrients in an ecosystem which increases the primary productivity of the ecosystem (0.5 pt)

Sedimentation: the tendency for particles travelling in the water to settle in a given area in response to the absence of a force moving them (e.g. the absence of a current) (0.5 pt)

Reference:

Estuaries in Ontario, p. 44-47

STOP 3

AQUATIC ECOLOGY (2 points)

EQUIPMENT

Use the 2011 Angler's Guide provided at this stop to answer the following questions.

In the North East Division which includes reaches of the Churchill and Nelson Rivers, generally one can angle all year around, except for some specific waterbodies.

a. The Nelson River and its tributaries are closed to fishing for which species? (0.5 pt)

b. The closure is between what dates annually? (0.5 pt)

_____ to _____

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Answer:

- a. *False: Phosphorus binds easily with calcium and magnesium, which are common soil constituents in Manitoba. (1 pt)*
- b. *True (1 pt)*

Reference:

Soil Management Guide, p. 53-54

WILDLIFE (2 points)

- a. What is the unique dental characteristic of a carnivore? (1 pt)

- b. Provide one example of a carnivore that can be found in Manitoba's wild. (1 pt)

Answer:

- a. *Long, sharp canines or carnassials. (1 pt)*
- b. *Any of the following (1 pt):*
 - *Wolves*
 - *Fox*
 - *Lynx*
 - *Wolverine*
 - *Weasel*

Reference:

Wildlife Document, p. 42

THEME: FRESH AND SALT WATER ESTUARIES (10 points) **EQUIPMENT**

Using the GPS unit provided at this stop, input the coordinates for the town of Hecla (14 U 0663208 5667555). Determine the distance and bearing from the flag located at this stop to the town of Hecla. (5 pts each for distance and bearing)

Answer:

Distance:

- *within 10 metres (5 pts)*
- *within 50 metres (4 pts)*
- *within 100 metres (3 pts)*
- *within 200 metres (2 pts)*
- *within 500 metres (1 pts)*

Bearing (5 pts)

- *within 3 degrees (5 pts)*

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- within 5 degrees (4 pts)
- within 7 degrees (3 pts)
- within 10 degrees (2 pts)
- within 15 degrees (1 pt)

Reference:

Provincial Theme Training and GPS material on MFA website

STOP 4

AQUATIC ECOLOGY (2 points)

EQUIPMENT

Using the materials provided at this stop – *The Freshwater Fishes of Manitoba* (laminated key from the book if preferred) and diagram illustrating external features – identify by its common name each of the fish species labelled A & B displayed at this stop. (*Note: you will need to identify to Family and then go to the page directed to use the Family Key to identify each of the below to common name.*) (1 pt each)

A. _____

B. _____

Answer:

A. Three spine stickleback

B. Brook stickleback

Reference:

Training/Aquatic Resources

FORESTRY (2 points)

Why do trees like cedar, tamarack or black spruce that grow in bogs tend to concentrate their roots at the surface?

Answer:

To obtain oxygen. The air spaces deeper down are filled with water. (2 pts)

Reference:

Deduction; Knowledge of root functions

SOILS AND LAND USE (2 points)

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Fill in the blanks. (1 pt each)

- a. _____ is the name given to the original loose mineral and organic materials from which soils develop.
- b. Lacustrine is a term used to describe material deposited by a _____.

Answer:

- a. *parent material (1 pt)*
- b. *lake (1 pt)*

Reference:

Soil Management Guide, p. 8

WILDLIFE (10 points)
EQUIPMENT

Refer to the pelts provided at this stop to answer the following questions.

- a. Identify the wildlife species to which these sample pelts belong (2 pts - 1 pt each)

Species A: _____

Species B: _____

- b. Both of these species have a streamlined body shape. How does this characteristic benefit these mammals? (1 pt)
- c. If Species A depends on sea ice for its home and Species B lives in the sea and rests on the land, which species potentially faces the greater negative impact to its habitat because of climate change? (1 pt) Why? (1 pt)

Refer to the animal track provided at this stop to answer the following questions.

- d. Identify the wildlife species which made this track. (1 pt) _____
What domestic animal has a similar track? (1 pt) _____
- e. List one (1) reason why you might want to avoid contact with this species. (1 pt)

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f. Circle the best response. Which wildlife category is best suited for this species? (1 pt)

Game animals Non-game animals Fur-bearing animals

g. List one (1) other wildlife species which falls into the same category. (1 pt)

Answer:

- a. *Species A: ringed seal (1 pt), Species B: harp seal (1 pt)*
- b. *helps them to swim in water (1 pt)*
- c. *Species A OR ringed seal (1 pt); climate change causes sea ice to melt (1 pt)*
- d. *coyote (1 pt); dog (1 pt)*
- e. *Any of the following (1 pt):*
 - *avoid disease*
 - *avoid parasite*
 - *avoid a dangerous animal*
- f. *fur-bearing animal (1 pt)*
- g. *Any of the following (1 pt):*
 - *pine marten*
 - *beaver*
 - *fox*
 - *muskrat*
 - *mink*
 - *raccoon*
 - *otter*
 - *lynx*

Reference:

Wildlife Training Session
Animal Tracks of Manitoba
Living with Wildlife in Manitoba: The Coyote
Wildlife Document, p. 18

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

a. Name the two (2) major challenges that organisms that live in estuaries face. (0.5 pt each)

1. _____

2. _____

b. The majority of organisms living on or in the sediments in estuaries have some form of physiological adaptations (changes relating to how their bodies function). Describe these changes in two (2) groups of organisms. (0.5 pt each)

1. _____

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2.

Answer:

- a. *variable salinity and how to stay put. (1 pt)*
- b. *Any two of the following(0.5 pt each):*
- *Crustaceans: excrete the salt as rapidly as it's absorbed.*
 - *Birds: possess salt glands that excrete excess salt.*
 - *Some other organisms (especially marine worms) contract their bodies to reduce the surface area that's in contact with the water and thus decrease the absorption of salt.*
 - *The last option is to have an impermeable surface - but only birds, reptiles, and mammals have this. A clam or mussel can only make itself temporarily watertight.*

Reference:

Fresh and Saltwater Estuaries: Material for Canon Envirothon, p. 23-24

STOP 5

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Notice the water pump located near this stop, provided for park users who require access to potable water.

- a. What is the general name for the type of water that is accessed by this pump and represents the largest single source of fresh water in most parts of the world? (1 pt)
- b. Circle the best response. Which percentage below best represents the percentage of Manitobans who rely on this type of water source for their municipal, domestic, and rural water needs (According to Statistics Canada, 1996). (1 pt)

15% 30% 45% 60% 90%

Answer:

- a. *groundwater (1 pt)*
- b. *30% (1 pt)*

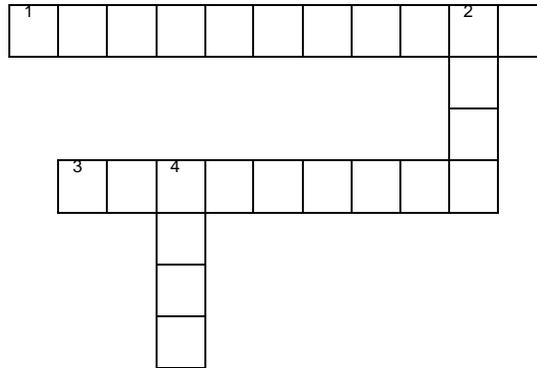
Reference:

http://www.thinktrees.org/my_folders/Envirothon_Aquatics_Resources_2010/groundwater.PDF

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FORESTRY (2 points)

Complete the crossword puzzle below. (0.5 pt each)



Across:

1. Manitoba's Provincial Tree (two words)
3. Any chemical preparation used to control populations of injurious organisms, plants, or animals.

Down:

2. A seed structure composed of many spirally arranged scales in which pollen ovules are produced.
4. Any standing dead, partially dead, or defective tree at least 3 meters tall.

Answer:

Across: 1. *WHITESPRUCE*, 3. *PESTICIDE* **Down:** 2. *CONE*, 4. *SNAG* (0.5 pt each)

Reference:

1. Forestry hand out: Manitoba's Forests, p. 7
2. to 4. Forestry material handout - glossary, p. 23-30

SOILS AND LAND USE (2 points)

Name the two (2) major factors that influence soil drainage. (1 pt each)

1. _____
2. _____

Answer:

*In general, drainage is primarily influenced by **soil texture** (1 pt) and **relief** (1 pt). Coarse-textured, porous soils allow excess water to pass through the soil, whereas finer-textured, compact clay materials tend to restrict water movement. Texture and drainage are independent factors, with relief having a greater influence on the drainage class of a soil than its texture. For example, sands in low-lying areas with high water tables are poorly drained, and clays in relatively higher portions of the landscape can be well-drained.*

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Reference:

Soil Management Guide, p. 15

WILDLIFE (2 points)

- a. Explain one (1) way in which a wildlife species can survive climate change. (1 pt)

- b. Which large, carnivorous mammal in Manitoba may be wiped out if sea ice is lost? (1 pt)

Answer:

- a. *Any of the following (1 pt):*
 - *adapt to environmental conditions*
 - *move to a new area*
- b. *polar bears (1 pt)*

Reference:

Wildlife Document, p. 29-30

THEME: FRESH AND SALT WATER ESTUARIES (10 points)

EQUIPMENT

- a. Using the conductivity meter provided at this stop, measure the conductivity of each sample provided at this stop and record your readings below. Be sure to clean the probe between each sample measurement. (1.5 pts - 0.5 pt each):

Sample 1: _____

Sample 2: _____

Sample 3: _____

- b. Circle the best response. Based on the conductivity reading in (a.), which sample is considered to be saltwater? (0.5 pt)

1

2

3

- c. The measurement of conductivity is important when using what piece of biological sampling equipment? (1 pt)

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- d. Fill in the blank. The movement of water through a semi-permeable membrane from a dilute to a more concentrated solution is called _____ . (1 pt)
- e. Refer to the object in the container labelled Theme 1. Notice the same object located on the table beside the container. Circle the best responses for the following two (2) questions.
- i. In comparison to the object on the table, how would you describe the object in the container? (0.5 pt)
- shrivelled plump
- ii. Notice the appearance of the object in the container. What kind of water is the object likely in? (0.5 pt)
- freshwater saltwater
- iii. Explain your answer for (ii.). (1 pt)
- f. Pretend the object is a fish. What are two (2) adaptations fish have to survive in this environment? (2 pts - 1 pt each)
- g. Fill in the blank. Fish that live part of their life in freshwater and part in saltwater are called _____ . (1 pt)
- h. List one (1) reason why estuaries are important for those species that move between fresh and salt water? (1 pt)

Answer:

- a. Conductivity Readings: **TBD** (1.5 pts)
- b. 1 (0.5 pt)
- c. electro-fisher (1 pt)
- d. osmosis (1 pt)
- e. i. plump (0.5 pt); ii. Freshwater (0.5 pt); iii. Object more strongly concentrated compared to the surrounding liquid so water is trying to diffuse into the object. (1 pt)
- f. Any two of the following (1 pt each):
- Doesn't drink water
 - Water that does enter by osmosis goes to the kidneys and is used to carry away waste products in large amounts of dilute urine.
 - internal organs have evolved to hang on to salts/electrolytes, but get rid of fluids
- g. Diadramous (1 pt)

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- h. *It is within the estuaries that diadromous species make the physiological adjustments (changing their drinking rate, the degree of concentration of their urine, the direction of ion-pumping in the gills, etc.) necessary for transitioning between fresh and salt water. (1 pt)*

Reference:

Regional and Provincial Aquatic Training

STOP 6

AQUATIC ECOLOGY (2 points)

EQUIPMENT

“Invert Mania Game”

Select one deck of invert cards (yellow or blue) provided at this stop. Indicate your selection by circling the appropriate colour: Yellow Blue

Using the laminated Sorting Sheet provided at this stop, sort the invert sample (i.e. those contained in the deck of yellow or blue cards) and answer the following questions.

- a. Circle the best response. Which Group had the most different kinds of invertebrates? (0.5 pt)
- Group 1 Group 2 Group 3
- b. What is the name of the most abundant invertebrate in the sample? (0.5 pt)
- c. Circle the best response. Based on your sample, how would you rate the water quality? (0.5 pt)
- Excellent Fair Poor
- d. Using the sorting sheet provided, identify the specimen displayed in the vial at this stop. (0.5 pt)

Answer:

Yellow Invert sample:

- a. *Group 2 (0.5 pt)*
b. *midge (0.5 pt)*
c. *fair (0.5 pt)*
d. *stonefly (0.5 pt)*

Blue Invert sample:

- a. *Group 3 (0.5 pt)*
b. *aquatic worm (0.5 pt)*

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- c. *poor* (0.5 pt)
- d. *stonefly* (0.5 pt)

Reference:

Training/Aquatic Resources

FORESTRY (10 points)
EQUIPMENT

Refer to the samples provided at this stop. This tree was cut down because it had died from an invasive forest pest.

- a. How old was this tree when it was cut? _____ yrs. (2 pts)
- b. What species of tree is this sample from? _____ (1pt)
- c. What invasive forest pest did this tree likely die from? _____ (2 pts)
- d. Circle the best response. Which methods are used in studying wildfire history? (1 pt)
 - i. interpreting fire scars
 - ii. drilling for pollen in swamps
 - iii. dating soils carbon traces
 - iv. interpreting records and maps
 - v. all of the above
- e. Using the Field Guide to the Native Trees of Manitoba provided at this stop, identify the four (4) marked trees or samples. (4 pts - 1 pt each)

A – _____

B – _____

C – _____

D – _____

Answer:

- a. *30 years* (marking range: 30=2, 29/31=1, 28/32=0.5 pts)
- b. *American or White Elm* (1 pt)
- c. *Dutch Elm Disease* (2 pt)
- d. *v* (1 pt)

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e. **TBD** (1 pt each)

Reference:

a. training material, b. & e. tree guide, c. forest pests, MB Conservation website, d. Pulp and Paper, Clearcutting, p. 4

SOILS AND LAND USE (2 points)

a. Define **soil erosion by water** (a.k.a. water erosion). (1 pt)

b. True or False. Circle the best response. (1 pt)

Sandy soils are more susceptible to water erosion than clays or loams. T F

Answer:

a. *Water erosion is the detachment, movement and removal of soil from the land surface by precipitation and leaving the landscape as runoff.* (1 pt)

b. *False: sands are less susceptible to water erosion than clays or loams.* (1 pt)

Reference:

Soil Management Guide, p. 88

WILDLIFE (2 points)

a. Fill in the blank. (1 pt)

Human activities such as logging, housing, farming and cattle grazing remove _____ which is one of the five (5) basic habitat needs.

b. One (1) function of this habitat need is: _____.

Answer:

a. *cover OR shelter* (1 pt)

b. *Any of the following* (1 pt):

- *provide shelter*
- *to hide in*
- *to raise young*
- *protection from bad weather*

Reference:

Wildlife Document, p. 13

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THEME: FRESH AND SALT WATER ESTUARIES (2 points)
EQUIPMENT

Use the GPS unit provided at this stop to determine the UTM coordinates of the flagged post at this stop.

Answer:

TBD

Reference:

Provincial Theme Training and GPS material on MFA website

STOP 7

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Refer to plants A, B & C illustrated in the photos on display at this stop to answer the following questions.

- a. Place these plants in order of occurrence starting from the shoreline and moving out into open water. (1.5 pts - 0.5 pt each)

(shoreline) _____ (open water)

- b. What is the near shore aquatic area called? (0.5 pt) _____

Answer:

- a. C, A, B (0.5 pt each)
b. Littoral zone (0.5 pt)

Reference:

Aquatic Resources - Plant Identification Guide

FORESTRY (2 points)

Jack Pine have very unique cones.

- a. What is the term that describes this type of cone? (1 pt)
- b. What is the evolutionary and ecological advantage for this type of cone? (1 pt)

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Answer:

- a. *serotinous* (1 pt)
- b. *allows species to recolonize an area immediately after a fire as cones only open when heated.* (1 pt)

Reference:

*Workshop Training
Forest fire knowledge*

SOILS AND LAND USE (10 points) EQUIPMENT

- a. On the soil survey map provided at this stop, locate section 18-15-5E. What is the predominant soil in this section as indicated on the map? (2 pts)
- b. What is the dominant surface texture of an Isafold soil series? (2 pts)
- c. What is the profile type of a Sb (Sandy Beaches) soil? (2 pts)
- d. What is the dominant native vegetation of a Marsh Complex soil type? (2 pts)
- e. What is the natural drainage of a Stonewall complex? (2 pts)

Answer:

- a. *Mh; Marsh Complex* (2 pts)
- b. *clay loam* (2 pts)
- c. *Regosol* (2 pts)
- d. *Slough grasses, reeds and sedges* (2 pts)
- e. *moderately good to good* (2 pts)

Reference:

Soil Management Guide; Fisher-Teulon Map sheet Soil survey report #12

WILDLIFE (2 points)

Consider a food web that consists of alfalfa, jack rabbits, coyotes, bald eagles, black bear, blue berries, shrubs, ants, and white-tailed deer.

- a. Identify which of the species listed above could be **both** a primary and secondary consumer. (1 pt)
- b. Explain why. (1 pt)

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Answer:

- a. *Black bears (1 pt)*
- b. *Because they are omnivorous (eats plants and animals) (1 pt). Primary consumer eats producers (plants). Secondary consumer eats primary consumers.*

Reference:

Wildlife Document, p.27

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

List two (2) criteria that Parks Canada considers when selecting a potential National Marine Conservation Area (NMCA) site. (1 pt each)

1. _____
2. _____

Answer:

Any two of the following (1 pt each):

- *quality of regional representation*
- *relative importance for maintaining biodiversity*
- *protecting critical habitats of endangered species*
- *exceptional natural and cultural features*
- *existing or planned marine protected areas*
- *minimizing conflict with resource users*
- *threats to the sustainability of marine ecosystems*
- *implications of Aboriginal claims and treaties*
- *potential for education and enjoyment*

Reference:

Fresh and Saltwater Estuaries: Material for Canon Envirothon, p. 83

STOP 8

AQUATIC ECOLOGY (2 points) **EQUIPMENT**

Examine the photos on display at this stop. One photo shows a mass of decaying algae on Grand Beach, Manitoba, across the south basin of Lake Winnipeg from Camp Morton. The other photos show two (2) different types of algae, labelled A and B.

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- a. Which of the two (2) algal types (A or B) in the photos could produce a mass such as that shown on Grand Beach? (1 pt) _____
- b. Why would the other algal type shown not grow well in the south basin of Lake Winnipeg? (1 pt)

Answer:

- a. B (1 pt)
- b. Any of the following (1 pt):
- not enough light penetration
 - nutrient levels too high
 - needs clear water and low nutrient levels to compete.

Reference:

http://www.thinktrees.org/my_folders/Envirothon_Aquatics_Resources_2010/Freshwater_Productivity.pdf
<http://lakes.chebucto.org/eutro.html#Eutrophication>
<http://lakes.chebucto.org/phyto.html>

FORESTRY (10 points)
EQUIPMENT

Pretend you are at a site of traditional importance to a First Nations community in Manitoba - scaled down of course! The community has hired you to map the points that they have designated as land use and occupancy sites.

- a. An example of a type of land use occupancy information is a burial ground site. List four (4) other examples of general types of land use and occupancy information that you might look for in the area. (4 pts - 1 pt each)

1. _____

2. _____

3. _____

4. _____

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Trail Test

- b. Go to each point (indicated by A, B, C, D, E, F) on the map provided at this stop. (Check with your stop attendant if you are not sure where to start.) Of the six (6) points identified, determine which four (4) (A, B, C, D, E, or F) might be examples of this community's land use and record them in the spaces provided. (4 pts - 1 pt each)
- _____

- c. If the trees in this area were going to be harvested in a forestry operation, which of the land use activities identified in (b) above might be affected by forestry activity? (1 pt)

- d. Before mapping, how was traditional land use information passed on from generation to generation? (1 pt)

Answer:

- a. *Types of land use and occupancy mapping information:*

- *Places where animals are harvested for food, clothing, medicines, tools, and other purposes.*
- *Places where plant materials are harvested for food, clothing, medicines, tools, shelter and fuel.*
- *Places where rocks, minerals, and soils are collected for making tools, conducting ceremonies, and other purposes.*
- *Ecological knowledge of habitats and sites are critical to the survival of important animal populations; for instance, caribou migration corridors, islands where moose calve, waterfowl breeding grounds and staging areas, and spawning beds. Habitation sites, such as settlements, trading posts, cabins, camps, and burial grounds.*
- *Spiritual or sacred places such as ceremony sites, rock paintings, areas inhabited by non-human or supernatural beings, and birth and death sites.*
- *Legends and other accounts about specific places.*
- *Travel and trade routes.*
- *Aboriginal place names.*

- b. *A, B, C, E, (1 pt each)*

- c. *all of them (1 pt)*

- d. *orally, through stories. (1 pt)*

Reference:

*Chief Kerry's Moose, Chapter 1
Site Training*

SOILS AND LAND USE (2 points)

Fill in the blanks. (0.5 pt each)

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Trail Test

Soil texture is the relative proportion of _____, _____ and _____ particles measuring less than _____ mm in diameter.

Answer:

Soil texture is the relative proportion of **sand** (0.5 pt), **silt** (0.5 pt) and **clay** (0.5 pt) particles measuring less than **2.0 mm** (0.5 pt) in diameter.

Reference:

Soil Management Guide, p. 11

WILDLIFE (2 points)

A variety of wildlife have evolved using different strategies for dealing with Manitoba's extreme climate, that includes being hot in the summer and very cold in the winter.

- a. Define the term **true hibernator**. (1 pt)

- b. Provide one (1) example of a true hibernator in Manitoba. (1 pt)

Answer:

- a. *a controlled significant drop in the metabolism to a selected level (1 pt)*
- b. *Any of the following (1 pt):*
 - *chipmunks*
 - *some mice*
 - *squirrels*
 - *groundhogs*

Reference:

Wildlife Document, p.34

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

Rank the following ecosystems according to plant material productivity from 1 to 4, where 1 = highest productivity and 4 = lowest productivity. (0.5 pt each)

- ___ Coastal
- ___ Estuarine
- ___ Moist Agriculture
- ___ Open Ocean

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Answer:

3 – Coastal (0.5 pt)

1 – Estuarine (0.5 pt)

2 – Moist Agriculture (0.5 pt)

4 – Open Ocean (0.5 pt)

Reference:

Hinterlands Who's Who - MFA website

STOP 9

AQUATIC ECOLOGY (2 points)

EQUIPMENT

Refer to the two (2) sampling devices, labelled A and B, on display at this stop to answer the following questions.

- a. Which of these devices would be most effective for quantitatively sampling the algal plankton (phytoplankton) community in a lake? (1 pt) _____
- b. Why would the other device be less effective for this purpose? (1 pt)

Answer:

a. A (1 pt)

b. Many smaller algal cells could slip through the mesh of the net (device B) and not be sampled accurately. (1 pt)

Reference:

www.thinktrees.org/my_folders/Envirothon_Aquatics_Resources_2010/Aquatic_Sampling_Techniques.pdf
Pre-test training

FORESTRY (2 points)

- a. Define **silviculture**. (1 pt)
- b. Clearcutting is used in both silviculture and harvesting. Describe why it is used in each. (1 pt – 0.5 pt each)

Harvest Method – _____

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Silviculture Method – _____

Answer:

- a. *Silvaculture: The art and science of growing trees or cultivating a forest*
- b. *Harvest Method – Cost effective, energy efficient way to maximize harvest in even aged stands.
Silvicultural method – a step in regeneration process to recreate even aged stands.*

Reference:

*Source: MB Conservation website
Silviculture in Manitoba*

SOILS AND LAND USE (2 points)

Name the two (2) conditions required for soil salinity. (1 pt each)

1. _____
2. _____

Answer:

1. *presence of soluble salts in subsoil, groundwater or both (1 pt)*
2. *high water tables that can result in soluble sales moving into the root zone of the soil through the upward movement of water. (1 pt)*

Reference:

Soil Management Guide, p. 65

WILDLIFE (10 points)
EQUIPMENT

- a. What is the term for plants in a food web? (1 pt) _____
- b. Refer to the leaf samples displayed at this stop. Using the *Plants of the Western Boreal Forest and Aspen Parkland* book provided at this stop, identify the two (2) plants to which these leaves belong. Use either the common names or the full scientific names (genus and species). (2 pts - 1 pt each)

Plant A: _____
(Hint: Plant A can be found in the Rose family, p. 131)

Plant B: _____
(Hint: Plant B can be found in the Buttercup family, p. 129)

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Trail Test

- c. Circle the best two (2) responses. In which ecosystems are you likely to find Plant B?
(Hint: consult the book.) (2 pts - 1 pt each):

Open woods Dense woods Rocky slopes Prairie

- d. List two (2) management techniques for a mixed grass prairie. (2 pts - 1 pt each)

1. _____
2. _____

- e. List three (3) species at risk (threatened or endangered) in Manitoba that live in a prairie ecosystem. (3 pts - 1 pt each)

1. _____
2. _____
3. _____

Answer:

- a. Producers OR Autotrophs (1 pt)
- b. Plant A: *Geum triflorum* (3-flowered aven); Plant B: *Aquilegia brevistyla* (blue columbine OR small-flowered columbine) (1 pt each)
- c. Open woods; rocky slopes (1 pt each)
- d. Any two of the following (1 pt each):
 - Grazing
 - Burning
 - Haying
 - Mowing
- e. Any three of the following (1 pt each):
 - Baird's sparrow
 - burrowing owl
 - loggerhead shrike
 - peregrine falcon
 - ferruginous hawk
 - great plains toad
 - small white lady's slipper
 - western prairie fringed orchid
 - western silvery aster
 - great plains ladies'-tresses
 - buffalograss
 - Riddell's goldenrod
 - hairy prairie-clover
 - Uncas skipper
 - Dakota skipper

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Trail Test

- *Ottoe skipper*
- *Mule deer*
- *Additional species from the MB SARA website: Sprague's Pipit, hackberry*

Reference:

General knowledge in identifying and matching up leaf shapes
Wildlife Document, p. 27, 29, 124
Manitoba Species at Risk

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

List four (4) things people can do in/around the house to protect estuaries. For each item, explain how it protects estuaries. (0.5 pt each)

1. _____

2. _____

3. _____

4. _____

Answer:

Any four of the following (0.5 pt each):

- *Use lawn fertilizer sparingly, or not at all. Follow product directions carefully. You'll keep it from washing into our streams and waterways.*
- *Leave grass clippings on the lawn. Clippings decompose and are efficient, natural fertilizers.*
- *Cut grass to proper height. A little more height is healthy, leading to a deeper root system and less erosion.*
- *Use native plants. Gardening and landscaping with plants native to your area reduces the need for watering and fertilizing your garden.*
- *Think before you pour. Too many hazardous products flow from drains through sewage plants into coastal rivers and estuaries.*
- *Keep septic systems working properly. Pump every three years to assure proper working condition.*
- *Use lawn care products sparingly, or not at all. Always follow the directions carefully. If these products wash into streams, roadside ditches or street gutters, it can affect plants and animals far from your home.*

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Trail Test

- c. Determine the cross sectional area of the channel using the data from (a.). (Show the formula and include the units). (1.5 pts – 0.5 pt for formula; 1 pt for answer)
- d. Determine the creek flow (velocity) by using an orange, stop watch, and the distance travelled, all provided at this stop. Record your measurements below. (1 pt – 0.5 pt each)

Distance Travelled (m): _____ (*this value will provided to you at this stop*)

Time (seconds): _____

Velocity (v): _____

- e. Using the velocity measurement you calculated in (d.), calculate the creek's discharge (Q). (1 pt - 0.5 pts each for formula and answer)

Discharge (Q): _____

- f. Hydroelectric development that includes dams on rivers affects downstream estuaries. List two (2) possible effects of dams on an estuary. (2 pts - 1 pt each)

1. _____

2. _____

Answer:

a. through e. **TBD on site**

f. change in the timing and rate of flow of freshwater which could affect any two of the following (1 pt each):

- the nature and duration of ice-cover
- habitats of marine mammals, fish, and migratory birds
- currents into and out of the receiving water body
- seasonal and annual loads of sediments and nutrients to downstream ecosystems (likely leading to lower biological productivity of estuaries and coastal areas)
- migration of anadromous fish populations

Reference:

Training

Aquatics Equipment Document

<http://www.carc.org/pubs/v19no3/2.htm> Canadian Arctic Resources Committee

Sustainable Development in the Hudson Bay / James Bay Bioregion

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Trail Test

FORESTRY (2 points)

- a. Define **Forest Certification**. (0.5 pt)
- b. What are the three (3) Forest Certification systems currently in use in North America?
(1.5 pts - 0.5 pt each)

1. _____
2. _____
3. _____

Answer:

- a. *Forest Certification is primarily about providing objective evidence of sustainable forest management. People around the world want to be assured that products they buy are not harming the environment. Forest Certification is one way that forest companies can publicly demonstrate that forest management practices maintain the health of the forest as well as the stability and livelihoods of local communities. (0.5 pt)*
- b. *The three forest certifications systems are (0.5 pt each):*
- 1. Canadian Standards Association (CSA)*
 - 2. Sustainable Forestry Initiative (SFI)*
 - 3. Forest Stewardship Council (FSC)*

Reference:

Forestry Binder, p. 18

Forestry handout - Training materials for Regionals - p. 37 lists examples

SOILS AND LAND USE (2 points)

EQUIPMENT

Suppose a soil contains 35% clay and 10% sand.

- a. How much silt does this soil contain? (1 pt)
- b. Use the textural triangle provided at this stop to determine the texture of the soil. (1 pt)

Answer:

- a. *The soil contains 55% silt. (1 pt)*
- b. *The texture of the soil is a silty clay loam. (1 pt)*

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Trail Test

Reference:

Soil Management Guide, p. 12

WILDLIFE (2 points)

a. Circle the best response. Which marine ecozone lies adjacent to Manitoba? (1 pt)

- i. Pacific Marine
- ii. Arctic Archipelago Marine
- iii. Arctic Basin Marine
- iv. Atlantic Marine

b. List two (2) marine mammal species that live in the marine ecozone adjacent to Manitoba. (1 pt - 0.5 pt each)

1. _____

2. _____

Answer:

a. i. *Arctic Archipelago Marine (1 pt)*

b. *Any two of the following (0.5 pt each):*

- *polar bear*
- *beluga whale*
- *bowhead whale*
- *walrus*
- *narwhal*
- *ringed seals*
- *bearded seals*
- *harp seals*

Reference:

Wildlife Document p. 52, 98-102

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

List four (4) reasons why willow is a suitable and commonly used vegetation species in shoreline restoration projects. (0.5 pt each)

1. _____

2. _____

3. _____

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Trail Test

4. _____

Answer:

Any four of the following (0.5 pt each):

- Flourishes in moist soils
- Reproduces easily (whips or cuttings)
- Matures in a short period (~4 years)
- Anchors the soil together (extensive root system)
- Slows the velocity of flood water/wind (reduces erosion)
- Over 75 species native to Canada (lots of choice).

Reference:

Estuaries in Ontario, Appendix B: "Why We Use Willow"

STOP 11

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Refer to the photo provided at this stop to answer the following questions.

- a. What is the name of this common estuary plant? (1 pt) _____
- b. Name two (2) benefits of this plant in an estuary. (1 pt - 0.5 pt each)
1. _____
2. _____

Answer:

a. eelgrass (1 pt)

b. Any two of the following (0.5 pt each):

- modifies coastal ecosystems by trapping sediments
- slows down currents
- major source of food for whole community of animals and plants
- provides shelter to organisms (small fish and fry get shelter from beds and feed in the beds.
- roots stabilize the bottom which also provides area for crabs and lobster to move around on.
- accumulations of dead eelgrass often found along beaches enriching other ecosystems.

Reference:

<http://www.glf.dfo-mpo.gc.ca/e0005896#fish> - Fisheries and Oceans "Estuaries"

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Trail Test

FORESTRY (2 points)

a. List two (2) **similar** impacts of clearcutting and fire on a forest. (1 pt - 0.5 pt each)

1. _____

2. _____

b. List two (2) **different** impacts of clearcutting and fire on a forest. (1 pt - 0.5 pt each)

1. _____

2. _____

Answer:

a. Any two of the following (0.5 pt each):

- both allow increased sunlight to reach the ground
- both can result in some level of erosion & runoff
- both will generally regenerate a new, in most cases even-aged forest.

b. Any two of the following (0.5 pt each):

- generally numerous dead standing trees after a fire
- amount of above ground material differs – more on a burn left as ash (harvested material is removed from cutover)
- logging leaves more soil material on the site than fire
- heat from fire contributes to the breakdown of rock into soil
- fires often remove or reduce insect and fungi – including pathogens
- logging generally requires roads which result in other impacts.

Reference:

Forestry Resource Guide - Fire Ecology, Clearcutting

SOILS AND LAND USE (2 points)

EQUIPMENT

Soil structure refers to the way in which soil particles cling together to form aggregates. Refer to soil samples A and B displayed at this stop to answer the following questions.

a. What type of structure does sample A have? (1 pt)

b. What type of structure does sample B have? (1 pt)

Answer:

- a. TBD
b. TBD

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Reference:

Soil Management Guide, p. 14-15; Training session

WILDLIFE (10 points)

EQUIPMENT

- a. Notice the ant hill flagged at this stop (do not disturb the ants or the hill). This is the home to a colony of thatching ants. Why might these ants also be known as “mound ants”? (1 pt)

- b. List one (1) reason why these ants might be a problem for people. (1 pt)

- c. Match each adaptation to the appropriate benefit listed below by writing the appropriate number in the space provided. Use each Benefit only once. (4 pts - 1 pt each)

<u>Adaptation</u>	<u>Benefit</u>
___ seasonal coats	(1) grinds up woody material
___ short ears	(2) conserves heat
___ ridged molars	(3) sheds water, snow, and wind
___ guard hairs	(4) blends into environment

- d. For each adaptation listed in the table below, provide an example of an animal or plant that uses this adaptation. Do not use the same species twice. (4 pts - 1 pt each)

Adaptation	Example of a species
Seasonal coat	
Short ears	
Ridged molars	
Guard hairs	

Answer:

- a. *The ants construct mounds in the ground for their habitat. (1 pt)*
- b. *Any of the following: ant bites, visually displeasing ant hills on lawns, property. (1 pt)*
- c. *4 = seasonal coat (1 pt)*
2 = short ears (1 pt)
1 = ridged molars (1 pt)
3 = guard hairs (1 pt)

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- d. *Seasonal coat: snowshoe hare, arctic hare, ptarmigan, weasel (1 pt)*
Short ears: lynx, snowshoe hare, arctic fox (1 pt)
Ridged molars: moose, elk, deer (1 pt)
Guard hairs: beaver, muskrat, mink, sea otter, river otter, seals (1 pt)

Reference:

General reasoning skills for questions a and b.
Wildlife Document: Plant and Animal Adaptations

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

Explain two (2) differences between a fresh water and salt water estuary. (1 pt each)

1. _____

2. _____

Answer:

Any two of the following:

- *Freshwater driven by storm events; saltwater driven by ocean tides*
- *Freshwater located where a river meets a lake; saltwater located where a river meets an ocean*
- *Salt absent in freshwater; medium to high salt concentration in saltwater*

Reference:

Estuaries in Ontario, p. 3

STOP 12

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Notice the flagged area near this stop where surface water collects during wet periods and the vegetation is distinctly different from the surrounding grassland. This is a small, local example of a wetland ecosystem.

- a. How does the productivity of wetland ecosystems compare to that of most other ecosystems on earth? (1 pt)
- b. Why are these ecosystems often referred to as "nature's kidneys"? (0.5 pt)

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Trail Test

- c. Which highly visible group of vertebrates (animals with backbones) has more than 200 species in Canada that are heavily dependent on wetlands for their life support? (0.5 pt)

Answer:

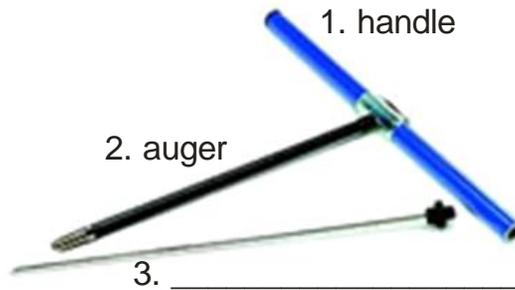
- a. Among the most productive on Earth (1 pt)
b. They act as natural filtration systems (0.5 pt)
c. birds (0.5 pt)

Reference:

http://www.thinktrees.org/my_folders/Envirothon_Aquatics_Resources_2010/wetlands.pdf
"The wetland Ecosystem"

FORESTRY (2 points)
EQUIPMENT

- a. The diagram below depicts a tool used to measure the age of trees. What is this tool called? (1 pt)
- b. Label item number three (3) in the diagram below. (1 pt)



Answer:

- a. Increment Corer, Increment borer (1pt)
b. extraction spoon or extraction tray (1 pt)

Reference:

Training Session

SOILS AND LAND USE (10 points)
EQUIPMENT

Refer to the soil pit located at this stop.

- a. Using the hand texturing guide provided at this stop, determine the soil texture of the A horizon. (1 pt)

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Trail Test

- b. Using the ruler provided at this stop, determine the soil depth of the A horizon. (1 pt)
- c. Are there carbonates present within the soil profile? If so, at what depth? (1 pt)
- d. Using the Munsell colour chart, determine the colour of the parent material. (1 pt)

Use the *Canadian System of Soil Classification* provided at this stop to determine the following (*hint: NOT a Podzol*):

- e. Soil Order (2 pts): _____
- f. Great Group (2 pts): _____
- g. Subgroup (2 pts): _____

Answer:

a-d: TBD (1 pt each)

e-g: TBD (2 pts each)

Reference:

The Canadian System of Soil Classification handbook

WILDLIFE (2 points)

EQUIPMENT

- a. Identify the plant species flagged at this stop. (1 pt)
- b. True or False. Circle the best response. (1 pt)

Birds and mammals which eat the fruits of this plant disseminate the seeds in their droppings. T F

Answer:

- a. "Strawberry" OR any of the following names: Woodland strawberry, Fraises des Bois, Wild strawberry, European strawberry, Alpine strawberry (1 pt)
- b. True (1 pt)

Reference:

Wildlife Training Session

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Trail Test

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

Explain the terms listed below. (1 pt each)

stenohaline organisms: _____

euryhaline organisms: _____

Answer:

- ***Stenohaline:*** describes plants and animals that can tolerate only slight changes in salinity (Sumich, 1996). These organisms usually live in either freshwater or saltwater environments. Most stenohaline organisms cannot tolerate the rapid changes in salinity that occur during each tidal cycle in an estuary. (1 pt)
- ***Euryhaline:*** describes plants and animals that can tolerate a wide range of salinity. These are the plants and animals most often found in the brackish waters of estuaries. There are far fewer euryhaline than stenohaline organisms because it requires a lot of energy to adapt to constantly changing salinities. (1 pt)

Reference:

Fresh and Saltwater Estuaries: Material for Canon Environthon, p. 72

STOP 13

AQUATIC ECOLOGY (2 points)

EQUIPMENT

a. Using the thermometer provided at this stop, determine the water temperature of the creek located at this stop and record it in the space provided. (0.5 pt) _____

b. Circle the best response. At what temperature on the centigrade scale is water most dense? (0.5 pt)

- i. 100 ii. 4 iii. 0 iv. -32

c. Circle the best response from the choices provided in parentheses. (0.5 pt)

As the water temperature warms during the day, the water will hold (**more / less**) oxygen.

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- d. Circle the best response. What nutrient is the “Basic Building Block” of all living things?
(0.5 pt)

Hydrogen Oxygen Carbon Nitrogen Phosphorus

Answer:

- a. **TBD** (0.5 pt)
b. ii (0.5 pt)
c. less (0.5 pt)
d. Carbon (0.5 pt)

Reference:

Aquatics Binder

FORESTRY (2 points)

Riparian zones are managed through Best Management Practices (BMP's).

- a. Fill in the blank. The component of forest harvesting operations that creates the largest amount of pollution entering a watercourse is _____.
(1 pt)
- b. Circle the best response. The BMP principle behind reducing the effects of sediment is to: (1 pt)
- i. limit harvesting operations in fragile riparian areas
 - ii. direct waterflow towards undisturbed vegetation
 - iii. promptly revegetate stream crossings
 - iv. all of the above

Answer:

- a. road constructions (1 pt)
b. iv (1 pt)

Reference:

Buffer Management Report

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Trail Test

SOILS AND LAND USE (2 points)

Fill in the blanks. (1 pt each)

There are two (2) main types of tillage systems. _____ tillage is a system that traditionally uses mouldboard plows or chisel plows with sweeps, followed by disking, harrowing or some other secondary tillage. _____ tillage systems, which include reduced tillage and zero tillage, produce benefits such as reduced erosion and reduced fossil fuel use.

Answer:

Conventional; Conservation (1pt each)

Reference:

Soil Management Guide, p. 98

WILDLIFE (2 points)

- a. Define **population dynamics**. (1 pt)
- b. What are the two (2) major factors that affect the population dynamics of wildlife? (1 pt - 0.5 pt each)
1. _____
2. _____

Answer:

- a. *The changes that occur in a population over time. (1 pt)*
- b. *Birth rate & death rate (0.5 pt each)*

Reference:

Wildlife Document, p. 16

THEME: FRESH AND SALT WATER ESTUARIES (10 points)

Refer to the estuary that can be seen at this stop.

- a. What type of estuary is this? (1 pt)

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Trail Test

b. Describe five (5) possible human impacts on this estuary. (5 pts - 1 pt each)

1. _____
2. _____
3. _____
4. _____
5. _____

c. Define **biomagnification**. (1 pt)

d. List the three (3) factors that influence the rate of bioaccumulation. (3 pts - 1 pt each)

1. _____
2. _____
3. _____

Answer:

a. *fresh water estuary (1 pt)*

b. *Any five of the following (1 pt each):*

- *Water diversion*
- *Dams and dykes*
- *Draining*
- *Importance of Solid Riverbanks*
- *Increased sediment load*
- *Development of farms and marinas*
- *Degrades water habitat*
- *Industrial and domestic waste*
- *Chemical spills*
- *Overfishing*
- *Introduction of invasive species.*

c. *Biomagnification: as the predator species continues to eat contaminated prey, they begin to build up very high concentrations of the pollutant, this is known as biomagnification. (1 pt)*

d. *The concentration of pollutant in the water; The water temperature: if the metabolism of the organism increases, so too may its rate of uptake; The age and sex of the organism. (3 pts)*

Reference:

a. *Salt and Fresh Water Estuaries, p. 5*

b. *Salt and Fresh Water Estuaries, p. 36-39*

c. & d. *Salt and Fresh Water Estuaries, p. 13*

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Trail Test

STOP 14

AQUATIC ECOLOGY (10 points)
EQUIPMENT

Using a sampling jar provided at this stop, collect a water sample from nearby Lake Winnipeg and bring it to your table. Use the filtration apparatus and a new, clean, filter paper (both provided at this stop) to filter 100 ml of the lake water. Carefully remove the filter paper from the funnel. Examine it, and complete the following:

- a. Fill the blanks in the following paragraph by selecting the most appropriate terms from the list below. Note that there are more terms than you will require to fill in all the blanks, so choose only the five (5), most specific, correct terms. (5 pts - 1 pt each)

Filtration of raw water is intended to separate the _____ or _____ fraction from the dissolved fraction. The filtered portion containing the dissolved substances is called the _____. Once separated, these fractions can independently undergo _____ to determine the relative _____ composition of each fraction.

solvent
particulate
filtrate
liquid

analysis
colored
metamorphosis
chemical

suspended
phosphorus
mutation

- b. Refer to the filter paper on display, through which 50 ml of water from the Red River at Winnipeg has been filtered. Compare the appearance of your filter from Lake Winnipeg with that of the Red River filter.
- i. Which of the two (2) filters appears to have collected the greater amount of residue? (1 pt)
 - ii. Provide one (1) reason to explain this difference. (1 pt)
 - iii. List three (3) things that you would expect to find in the residue on the Lake Winnipeg filter, if it were examined under a microscope. (3 pts - 1 pt each)

1. _____

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2. _____
3. _____

Answer:

- a. answers in correct sequence: particulate, suspended, filtrate, analysis, chemical **OR** suspended, particulate, filtrate, analysis, chemical. (1 pt each)
- b. i. Red River filter (1 pt)
ii. Flowing water keeps more particulate material, particularly clay, in suspension (1 pt)
iii. clay particles or soil particles, algae or phytoplankton, zooplankton (1 pt each)
(Other answers to parts ii & iii will be considered and full or partial marks will be awarded if these answers are deemed to be correct.)

Reference:

www.thinktrees.org/my_folders/Envirothon_Aquatics_Resources_2010/Aquatic_Sampling_Techniques.pdf
<http://lakes.chebucto.org/swcs-limne.html#plankton>
http://www.thinktrees.org/my_folders/Envirothon_Aquatics_Resources_2010/chemmon.pdf
Pre-test training

FORESTRY (2 points)

- a. What concept related to forestry does the diagram below represent? (0.5 pt)



- b. What is a forest stakeholder? (0.5 pt)
- c. List two (2) examples of a forest stakeholder. (1 pt - 0.5 pt each)
1. _____
2. _____

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Answer:

- a. *Sustainable Forest Management (0.5 pt)*
- b. *A forest stakeholder is a individual or group of people that has a vested interest in how the forest is managed for different forest values. (1 pt)*
- c. *Any two of the following (0.5 pt each):*
 - *Fisherman/fishing*
 - *Outfitters: fly-in fishing camps/bear hunting camps/wilderness guides/hunting guides*
 - *Trappers*
 - *Snowmobile clubs/ATV groups*
 - *Canoeists/motor boaters*
 - *local communities*
 - *First Nations*
 - *Photographers/Naturists/Environmental groups*
 - *berry pickers*
 - *Basically anyone that uses the forest*

Reference:

- a. *Forestry Training handouts*
- b. *Forestry handout - Regional training - p. 7 lists examples*

SOILS AND LAND USE (2 points)

List two (2) examples of nitrogen sources which may enhance plant growth in the soil. (1 pt each)

1. _____
2. _____

Answer:

Any two of the following (1 pt each):

- *(chemical) fertilizer*
- *(livestock) manure*
- *sewage sludge*
- *compost*
- *humus*
- *soil organic matter*

Reference:

Soil Management Guide, p. 52

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WILDLIFE (2 points)

In 1995, Canada developed the Canadian Biodiversity Strategy.

a. How does the Strategy protect biodiversity with regard to alien species? (1 pt)

b. True or False. Circle the best response. (1 pt)

It's easier to control invasive alien species in Canada once their populations are already established.

T

F

Answer:

a. *monitoring and controlling the importation of alien species (1 pt)*

b. *False (1 pt)*

Reference:

Wildlife Document, p. 130-134

THEME: FRESH AND SALT WATER ESTUARIES (2 points)

Provide two (2) reasons that the Nelson River estuary has remained relatively unexplored until recently. (1 pt each)

1. _____

2. _____

Answer:

Any two of the following (1 pt each):

- *large area*
- *remote location (no access by land)*
- *harsh climate*
- *difficult navigation conditions*
- *ice-cover most of the year*

Reference:

Exploring the Physical Environment of a SubArctic Estuary: The Nelson River Estuary, p. 3

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STOP 15

AQUATIC ECOLOGY (2 points)
EQUIPMENT

The satellite photo on display at this stop shows the south basin of Lake Winnipeg near the end of May, 2009, also a year in which the Red River was undergoing a major flood event. The estuaries of two (2) of the three (3) largest tributaries to the Lake Winnipeg are identified on the photo. Note how the colour of the lake surface offshore from the mouth of the Red River differs from the colour offshore from the mouth of the Winnipeg River.

What explains this difference in water colour offshore from the mouths of these two (2) major tributary rivers? (2 pts)

Answer:

The Red River drains prairie soils and is carrying large quantities of clay and soil particles into the lake, which stay in suspension for some time. (1 pt) The Winnipeg River is draining Boreal Shield and carries relatively little soil and particulates, but does carry more darkly coloured, dissolved organic substances. (1 pt)

(At the discretion marker, half points will be awarded for partial answers.)

Reference:

http://www.thinktrees.org/my_folders/Envirothon_Aquatics_Resources_2010/Sustaining_Aquatic_Ecosystems_in_Boreal_Regions.PDF

Interactions of Lakes and Streams with their Catchments

http://www.thinktrees.org/my_folders/Envirothon_Aquatics_Reso

FORESTRY (2 points)

List four (4) functions of riparian zones and surrounding forests. (2 pts - 0.5 pt each)

1. _____
2. _____
3. _____
4. _____

Answer:

Any four of the following (0.5 pt each):

- *increase bank stabilization*
- *decrease pollution input*

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- *enrich the soil*
- *provide habitat for organisms*
- *etc. (See G. Peterson for other possible responses.)*

Reference:

Ontario Theme document, p. 35

SOILS AND LAND USE (10 points)

Notice the slumping along the lakeshore that has occurred in this area due to bank instability.

a. Why may this have occurred? (1 pt)

b. List two (2) methods that could be used to stabilize this area. (2 pts - 1 pt each).

1. _____

2. _____

c. Soils in water-saturated riparian areas are often undeveloped, aluvial deposits. To which Soil Order would they likely belong? (1 pt)

d. Name two (2) soil forming factors. (2 pts - 1 pt each)

1. _____

2. _____

e. Describe the influence of grassland vegetation on soil formation. (2 pts)

f. Name two (2) modes of deposition that contribute to soil formation. (2 pts)

1. _____

2. _____

Answer:

a. *Trees (and roots) were removed from lakeshore (1 pt)*

b. *Any two of the following (1 pt each):*

- *planting of trees*
- *Planting of shrubs*
- *Planting of NATIVE grasses*
- *use of rock or rip-rap*

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- c. *Regosol or Gleysol (1 pt)*
- d. *Any two of the following (1 pt each):*
- *parent material*
 - *relief (or topography and drainage)*
 - *climate*
 - *organisms (or vegetation, animals, man)*
- e. *Grassland vegetation is typically found in areas where temperatures are moderate and large amounts of water are evaporated from the surface. Grassland vegetation produces large amounts of biomass below the soil surface resulting in large amounts of organic matter into the soil. Soils formed under grassland typically have thick A horizons that are dark in colour, resulting from high organic matter content. (2 pts)*
- f. *Any two of the following (1 pt each):*
- *till or morainal*
 - *lacustrine*
 - *fluvial*
 - *outwash*
 - *eolian*
 - *organic deposits*

Reference:

Critical thinking, Soil Management Guide, p. 8, 10, 19, 61-62

WILDLIFE (2 points)

Wetlands are an important ecosystem for many wildlife species.

- a. Define **wetland**. (1 pt)
- b. List two (2) of the major types of wetlands (1 pt - 0.5 pt each)
1. _____
 2. _____

Answer:

- a. *Wetland = an area of land that is covered with water for a part of the day or year (1 pt)*
- b. *Any two of the following (0.5 pt each):*
- *Ponds*
 - *Marshes*
 - *Swamps*
 - *Peatbogs (Note:bogs and fens are both peatbogs)*

Reference:

Wildlife Document, p. 107-109

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THEME: FRESH AND SALT WATER ESTUARIES (2 points)
EQUIPMENT

Determine the UTM Location of the points indicated on the map provided. Use the table below to record your responses. (2 pts -0.5 pt each)

	Easting	Northing
Green Dot		
Yellow Dot		

Answer:

TBD

Reference:

Provincial Theme Training