

BRANDON TRAIL

STOP 1

Aquatics (1) – 10 points
EQUIPMENT PROVIDED

10

A. List two (2) characteristics or features that are common to all riparian areas.
(2 pts. – 1 pt. each)

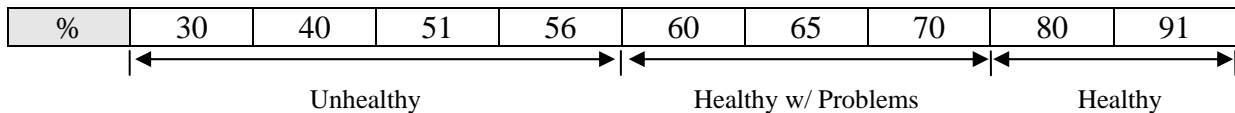
- 1) _____

- 2) _____

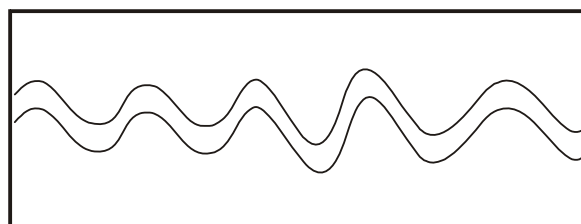
B. Using “Managing the Water’s Edge” and the flagged area provided at the stop, complete the following riparian assessment by filling in the chart. (6 pts. – 2 pts. each)

	Actual	Possible
Vegetative Cover of Floodplain and Streambanks 6 4 2 0		
Utilization of Preferred Tress and Shrubs 3 2 1 0		
Standing Decadent and Dead Woody Material 3 2 1 0		
TOTAL		

C. Using the chart below and the score you obtained in part B, determine the health of this riparian area. Circle the most appropriate response. (1 pt.)



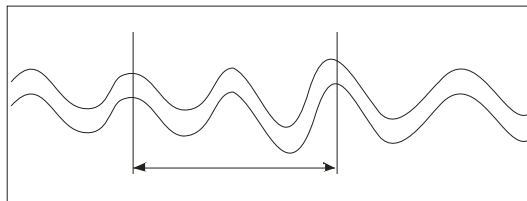
D. Indicate the reach length you would use to conduct a riparian assessment on the following small stream. (1 pt.)



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Answers:**A. Any 2 of the following:**

- combined presence and abundance of water, either on the surface or close to the surface
- vegetation that responds to, requires and survives well in abundant water
- soils that are often modified by abundant water (i.e. in high water tables), stream processes (i.e. sediment deposition) and lush, productive and diverse vegetation

B. TBD at trail site**C. TBD at trail site****D. two meander cycles**

Sources: Managing the Water's Edge (p. 7, 21)

Alternative or Renewable Energy (1) – 2 points

2

What are the main types of wave and tidal power generation? Provide two (2) for each. (1 pt. each)

wave power: _____

tidal power: _____

Answer: Wave power – fixed onshore and floating offshore. Tidal – tidal dams and ocean currents.

Source: Envirothon 2007 Theme Guide, p. 35

Forestry (1) – 2 points

What are two (2) potential positive effects on forest growth which could result from climate change? (2 pts. – 1 pt. each)

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1) _____

2) _____

Answers:

Longer growing season, increased growth due to increased CO₂, changes to precipitation patterns, increased efficiency of water use in plants,

Source: Event Training From What Trees can do...

Soils (1) – 2 points

Biological soil crusts are a complex mosaic of living organisms that grow on or just below the soil surface, common in drier regions and woodlands.

Why are these important for the soil/plant system of natural areas? Provide two (2) reasons. (1 pt. each)

1. _____

2. _____

Answer: Any 2 of the following

- *Provide a habitat for small fauna which contribute to building the soil*
- *Provides soil stability*
- *Increases soil fertility*
- *Helps to retain soil moisture*
- *Helps to prevent invasive weed species*
- *Acts as an indicator of rangeland health*

Source: Soil Biological Communities/ biological soil crusts

<http://www.blm.gov/nstc/soil/communities/index.html>

Wildlife (1) – 2 points

A. The City of Brandon is part of which terrestrial ecozone? (1 pt.) _____

B. How many square kilometres does this ecozone span? Circle the correct response. (1 pt.)

- a) 5,200,000 square kilometres
- b) 520,000 square kilometres

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- c) 5,200 square kilometres
- d) 5.2 square kilometres

Answers:

A. prairie

B. b)

Source: Environment Canada – An Introduction to Ecozones, page 52

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STOP 2**Aquatics (2) – 2 points**

Draw a diagram of the three (3) distinct thermal layers that form in deep lakes. Label each layer.

Answer: *Epilimnion (0.5)*
 Thermocline or Metalimnion (0.5)
 Hypolimnion (0.5)
 Correct order in diagram (0.5)

Source: “Water as Environment”

Alternative or Renewable Energy (2) – 2 points

What is the hydrogen economy? _____

Answer: *The use of hydrogen as a universal energy source as a replacement for the current oil-based economy.*

Source: Envirothon 2007 Theme Guide, p. 34; http://www.hydrogeneconomy.gc.ca/programs_e.html

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10

Forestry (2) – 10 points
EQUIPMENT PROVIDED

A. Using the equipment provided please measure the flagged tree and using the volume table provided calculate its volume.

Height _____ m (2 pts.)

Diameter _____ cm (2 pts.)

Volume _____ m³ (1 pt.)

B. Why are forests and trees measured? List three (3) reasons. (3 pts. – 1 pt. each)

1) _____

2) _____

3) _____

C. Tree diameters are measured at what standard height above the ground? (2 pts.)

Answers:

A. **TBD at trail site**

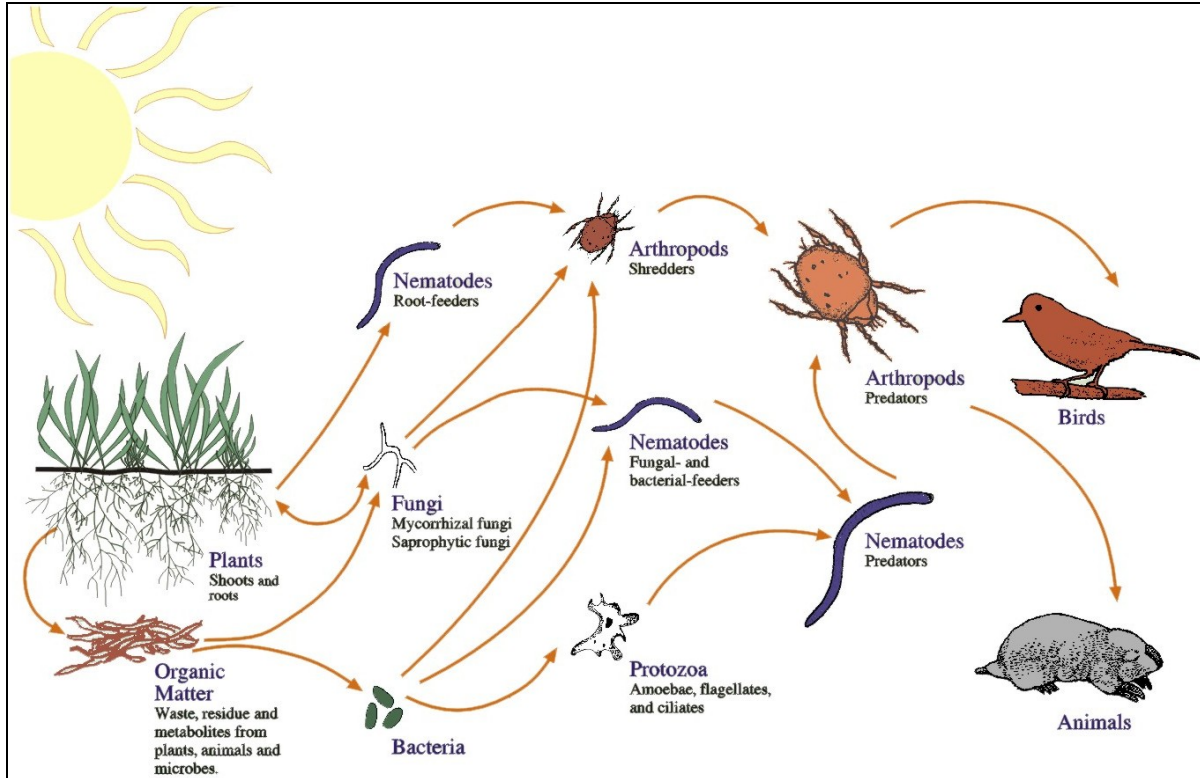
B. **Any 3 of the following**

- *calculate volume \ AAC*
- *calculate growth rates*
- *determine site productivity*
- *document forest health*
- *predict future development*

C. *Diameter at Breast Height or dbh, (1.3 meters, 4.5 feet)*

Source: Event Training

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Soils (2) – 2 points

A. What does the above diagram represent? (1 pt.) _____

B. What organisms fuel the above process? (1 pt.) _____

Answers:

A. Soil food web

B. All food webs are fuelled by the primary producers. In this case, it is plants, lichen, moss, photosynthetic bacteria and algae which use the sun's energy.

Source: The Soil Biology Primer/ The food Web

http://soils.usda.gov/sqi/concepts/soil_biology/biology.html

Wildlife (2) – 2 points

Populations of Canada Geese have increased significantly over the years in many urban areas. Give two (2) reasons why we have seen such an increase in the Canada Geese population. (1 pt. each)

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- 1) _____
- 2) _____

Answer: 1) *The birds thrive under the close protection and feeding opportunities they find in parks, near suburban wetlands, and on lawns or golf courses.* 2) *Because no hunting takes place in these areas, there are few natural factors working to limit population growth and disperse the birds (i.e., no natural predators).*

Source: Hinterland Who's Who – Canada Goose

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STOP 3**Aquatics (3) – 10 points****EQUIPMENT PROVIDED**

10

A. Use two (2) oranges and the stopwatch provided to calculate the mean cross-sectional velocity of the Assiniboine River. The distance between the two flags is 23 m. (3 pts.)

Velocity = _____

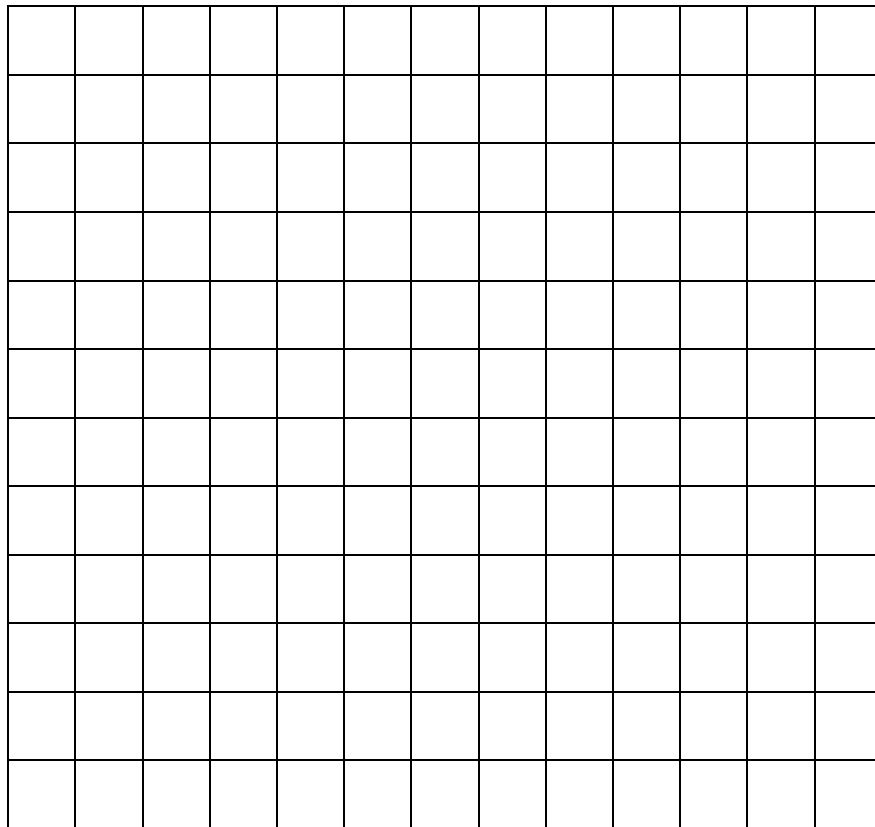
B. Using the information you calculated in part A and the diagram of the cross-sectional profile of the Assiniboine River (Aquatics Diagram B) provided at the stop, determine the discharge for the Assiniboine River. (2 pts.)

Discharge = _____

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C. Use the information in the following table to create a hydrograph (use a line graph). Be sure to label the graph. (4 pts.)

Mean Monthly Discharge (cms)	Month
5.20	January
4.70	February
8.21	March
81.20	April
104.00	May
59.90	June
46.80	July
22.30	August
15.50	September
16.10	October
13.10	November
7.57	December



D. On the graph above, use a dashed line to illustrate how the hydrograph would change if more development occurs in the surrounding area. (1 pt.)

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Answers:**A. TBD at trail site**

$$\text{surface velocity} = v_1 = \frac{d}{t_1} = \frac{23}{\quad} = \quad \quad m/s \quad 0.5 \text{ pts}$$

$$\text{surface velocity} = v_2 = \frac{d}{t_2} = \frac{23}{\quad} = \quad \quad m/s \quad 0.5 \text{ pts}$$

$$\text{mean surface velocity} = msv = \frac{(v_1 + v_2)}{2} = \quad \quad m/s \quad 1 \text{ pt}$$

$$\text{Mean Cross Sectional Velocity} = 0.8 \times msv = \quad \quad m/s \quad 1 \text{ pt}$$

B. TBD at trail site

$$\text{average depth} = \frac{(1.7 + 3.3 + 3.6 + 3.1 + 2.8 + 2.6 + 2.1 + 1.9 + 1.7 + 1.0)}{10}$$

$$\text{average depth} = 2.38 \text{ m}$$

$$\text{Cross Sectional Area} = csa = \text{depth} \times \text{width} = 2.38 \text{ m} \times 54 = 128.52 \text{ m}^2$$

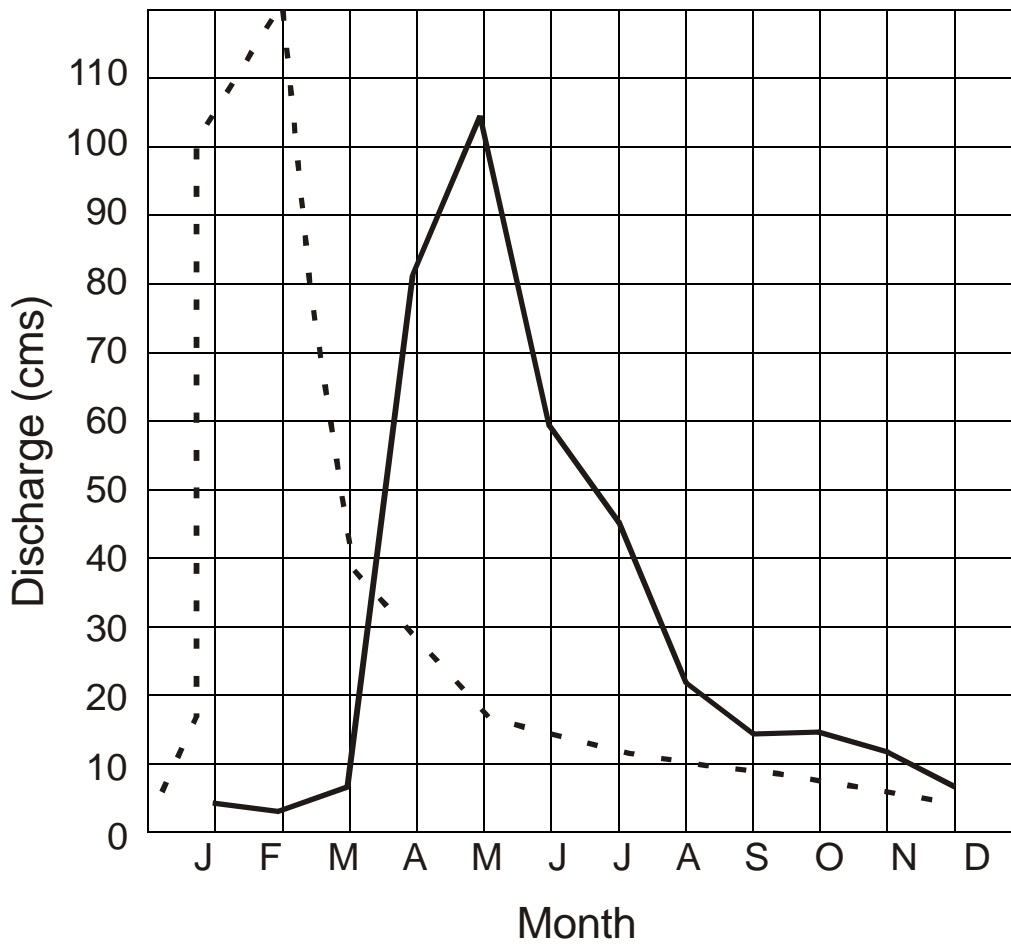
$$\text{Discharge} = csa \times \text{mean csv} = 128.52 \times \text{answer from a} = \quad \quad \text{m}^3 / \text{s}$$

C. see diagram below

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C.

Mean Monthly Discharge vs. Month



D. see dashed line above

Source: April 2007 Workshop

Alternative or Renewable Energy (3) – 2 points

A. What is “environmental impact assessment”? (1 pt.) _____

B. Give two (2) reasons why it is important. (1 pt. – 0.5 pt. each)

1) _____

2) _____

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Answer: *Environmental impact assessment is the evaluation of the impact of energy generation throughout its total lifecycle. These assessments can help to inform choices for construction locations so as to avoid sensitive wildlife habitat. They can also help in choosing an appropriate energy generation technology that is better suited to the local environment and the health of the wildlife population. Appropriate management and decision-making must account for local requirements, opportunities and limitations while simultaneously considering the global impact of its decisions.*

Source: Envirothon 2007 Theme Guide, p.47

Forestry (3) – 2 points

Name two (2) uses of harvested wood which are considered “long-term storage” of carbon and, as such, do not contribute to an increase of atmospheric CO₂. (1 pt. each)

- 1) _____
- 2) _____

Answer: *housing timber and furniture,*

Source: Event Training, also What Trees can do...

Soils (3) – 2 points

Circle the appropriate response. (1 pt. each)

A. Studies in Swift Current looking at the biochemical activity of the soil found that the C:N ratio in the soil was important in determining the activity of soil microbes. It was found that a high C:N ratio was more beneficial in increasing activity than a balanced C:N ratio.

True

False

B. Organic carbon increases after legume green manure crops are grown, as compared to after cereal crops.

True

False

Answers:

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- A. false*
B. true

Source: Microbes show the benefits of Green Manuring
http://www.organiccentre.ca/NewspaperArticles/na_microbes_manure.asp

Wildlife (3) – 2 points

What are some of the problems associated with an over population of geese?

***Answer:** Problems associated with geese include droppings on lawns and beaches, which may contaminate drinking water sources, aggressive behaviour toward humans, and collisions with aircraft.*

Source: Hinterland Who's Who – Canada Goose

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STOP 4**Aquatics (4) – 10 points**

EQUIPMENT PROVIDED

10

Using the graduated cylinder provided, obtain a 50 ml dip sample of surface water from the pond. Using the filter apparatus (filter funnel with clamp, filter flask, GFC filter paper and forceps, hand-operated vacuum pump), filter the water sample through the GFC filter paper, and then carefully remove the paper. Answer the following questions.

A. What scientific term can be used to describe the materials remaining on the filter paper? (1 pt.)

B. List two (2) possible constituents of this material. (2 pts. – 1 pt. each)

1) _____

2) _____

C. What scientific term can be used to describe the materials in the filtrate? (1 pt.)

D. List two (2) possible constituents in this filtrate. (2 pts. – 1 pt. each)

1) _____

2) _____

E. What important property of water is responsible for the presence of such materials in the filtrate? (1 pt.)

Compare the material on your filter paper to that on a filter paper (provided) obtained earlier today from a similar water sample from the nearby Assiniboine River. Answer the following questions.

F. Which filter paper (pond or river) would you expect to contain more **non-living**

(inorganic) material? (0.5 pt.) _____ Why? (1 pt.) _____

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G. Which filter paper (pond or river) would you expect to contain more **living** (organic) material? (0.5 pt.) _____ Why? (1 pt.) _____

Answers:

- A. suspended or particulate material*
- B. algae, soil particles, clay, silt, vegetation, plankton, etc*
- C. dissolved material*
- D. nutrients (e.g. dissolved nitrogen, phosphorus) dissolved oxygen, carbon dioxide, pesticides, drugs, metals, mercury, etc.*
- E. excellent (universal) solvent*
- F. The river filter. The moving water in the river would erode and carry more silt or soil particles.*
- G. The pond filter. More algae and zooplankton (microscopic plants and animals) could grow in the pond water, where sunlight is not intercepted by silt and other particles and the environment is more stable.*

Sources:

Training session at St. Leon
 CD/binder A1. "Water as Environment"

Alternative or Renewable Energy (4) – 2 points

Outline the benefits and concerns of a decentralized energy production system. Provide two (2) for each. (0.5 pt. each)

<u>Benefits</u>	<u>Concerns</u>

Answer:

- Benefits**
 - closer to end user (more decision-making)
 - reduced distribution costs
 - less vulnerable to wide scale system failure
- Concerns**
 - less cost efficient
 - health and safety standards

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Source: Envirothon 2007 Theme Guide, p.44

Forestry (4) – 2 points

Name two (2) ecological benefits that forest fires create in the forest. (1 pt. each)

- 1) _____
- 2) _____

Answer: reduces dead and dry organic matter, stimulates new growth, exposes mineral soil, stimulates germination of certain species, reduced fire hazard by reducing litter accumulation, allows se-seeding of pioneer or shade intolerant species,

Source: Fire Ecology

Soils (4) – 2 points

One of the emerging opportunities for sequestering greenhouse gases is related to growing of perennial forages, and extending the grazing season on pasture.

Give two (2) possible benefits related to reducing greenhouse gas emissions from agriculture related to pastures. (1 pt. each)

- 1) _____
- 2) _____

Answers: Any 2 of the following

- *Less energy required for swath grazing*
- *More appropriate use of marginal lands, as there will be less petroleum based inputs such as tillage and fertilizer*
- *Good pasture management will sequester carbon in the root zone*
- *Less transportation of manure from a feedlot to field: less fuel consumed.*

Source: Agricultural Outlook (2006-2010), page 2.

Wildlife (4) – 2 points

EQUIPMENT PROVIDED

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Using the field guide provided, identify the two (2) bird species shown in the picture.
(1 pt. each)

Sample A _____

Sample B _____

Answer: *Sample A – Short-eared owl; Sample B – Mourning Warbler*

Source: General decision making skills

STOP 5

Aquatics (5) – 2 points

EQUIPMENT PROVIDED

Using the map and ruler provided at the stop (Diagram A), determine the volume of the pond knowing that its depth is 2 meters. *Hint: assume the pond is a rectangle and ignore the island in the middle of the pond.*

If the Assiniboine River has a discharge of 81.2 cubic meters per second (cms) in April, how long would it take (in minutes) to fill this pond?

_____ volume

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_____ time

Answer: **TBD at trail site** (see below for formulas)

$$\text{Time} = \frac{\text{volume}}{\text{flow}}$$

Volume in cubic metres :

$$L = \text{scale} \times \text{measurement}$$

$$W = \text{scale} \times \text{measurement}$$

$$V = l \times w \times d$$

$$V = L \times W \times 2$$

$$V = \quad \quad m^3$$

$$\text{Time} = \frac{\text{m}^3}{81.2 \text{ cms}}$$

$$\text{Time} = \quad \quad s$$

$$\text{Time in Minutes} = \frac{\text{Time in Seconds}}{60 \text{ s/min}}$$

$$\text{Time in Minutes} = \frac{s}{60}$$

$$\text{Time in Minutes} =$$

Source: April Workshop and general knowledge

Alternative or Renewable Energy (5) – 2 points

What are considered to be conventional forms of energy in North America? Provide four (4) examples. (0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answer: *Hydro Electric, Nuclear Energy, Natural Gas, Fossil fuels, Coal*

Source: Manitoba Envirothon 2007 Theme Guide p. 17

Forestry (5) – 2 points

Many of the most recent, potentially destructive bark and wood-boring beetles are thought to have entered North America by which method?

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Answer: *Concealed within dunnage – wooden packaging material such as pallets, crates or drums*

Sources: Workshop training, Alien Forest Pests PDF

Soils (5) – 2 points

What are the factors of soil formation which act over time? Provide four (4). (0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answers:

1. *Parent material*
2. *Relief or topography or slope*
3. *Climate*
4. *Organisms or vegetation*

Source: Understanding the Soil Landscapes in Manitoba
<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s02.html>

Wildlife (5) – 10 points

EQUIPMENT PROVIDED

Manitoba has a wide variety of wildlife species. Some have wandered by and left their tracks. Please identify the tracks you see here, using the Animal Tracks of Manitoba. (1 pt. each)

a)
b)

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c)
d)
e)
f)
g)
h)
i)
j)

Answers:

<i>a) Beaver</i>
<i>b) Black Bear</i>
<i>c) Red Fox</i>
<i>d) Muskrat</i>
<i>e) White-tailed Deer</i>
<i>f) Moose</i>
<i>g) Great Blue Heron</i>
<i>h) Mallard</i>
<i>i) Canada Goose</i>
<i>j) Mink</i>

Source: Identifying and Preserving Wildlife Tracks PDF

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STOP 6**Aquatics (6) – 2 points**

Fill in the following chart that compares differences between standing waters, like the pond, and flowing waters, like the Assiniboine River. (0.5 pt. each)

Water	Standing	Flowing
Source of Oxygen		
Source of Food		

Answer:

Water	Standing	Flowing
Source of Oxygen	<i>Photosynthesis</i>	<i>Aeration</i>
Source of Food	<i>Producers</i>	<i>From surrounding land</i>

Source: "Water as Environment"

Alternative or Renewable Energy (6) – 10 points

10

A. List four (4) uses of biomass ethanol. (2 pts – 0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

B. What types of feedstocks can be used to produce ethanol? (1.5 pts. – 0.5 pt. each)

- 1) _____

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2) _____

3) _____

C. List four (4) ways that bioethanol fuel can impact the environment. (6 pts. – 1.5 pts. each)

1) _____

2) _____

3) _____

4) _____

D. How can bioethanol reduce carbon emissions? (0.5 pt.)

Answers:**A. Any 4 of the following**

- *petroleum substitute for automobiles*
- *food-grade vinegar*
- *food extracts*
- *pharmaceutical products*
- *cosmetics*
- *solvents*
- *beverages*

B. Sugars (sugar beet, sugar cane), starches (fruits, vegetables, and grains), cellulose (woody biomass, such as forestry wastes, willows, straw and grasses)

C. 4 answers:

- *Feedstock Growth (irrigation, erosion, and the use of fertilizers affect soil quality)*
- *Production (substantial water and energy used in fermentation, changing land use patterns by altering forestry/agricultural crops)*
- *Use (exhaust emissions affect air quality, changing agricultural crops alter wildlife habitat)*
- *By-products (excess solids, gases, and liquids enter waste stream but can also become value-added by-products)*

D. Energy crops are carbon neutral

Source: Developing Manitoba's Ethanol Industry, 2006, p. 2.

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Envirothon 2007 Theme Guide, p. 39
 Envirothon 2007 Theme Guide, chapters 4, 5, & 6
 Envirothon 2007 Theme Guide, p. 46

Forestry (6) – 2 points

A. Circle the correct response. The forest products industry has enough renewable electricity generation capacity to: (1 pt.)

- a) feed Vancouver
- b) power Edmonton and Calgary combined
- c) almost supply Ottawa-Gatineau twice
- d) almost enough power the entire needs of the maritime provinces
- e) all of the above

B. What is Biomass as it relates to the forest industry? (1 pt.)

Answers:

A. *e*

B. *Biomass is clean, green, carbon-energy source derived from industrial byproducts such as bark, wood shavings and sawdust.*

Source: Renewable energy in the forest Products – Fact Sheet

Soils (6) – 2 points

There are three (3) types of rock which are the parent material of Manitoba soils. Give two (2) of these. (1 pt. each)

_____ and _____

Answers: Any 2 of the following

- *Granite*
- *Shale*
- *Limestone*

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Source: Understanding the Soil Landscapes in Manitoba
<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s02.html>

Wildlife (6) – 2 points

EQUIPMENT PROVIDED

Using the Plants of the Western Boreal Forest and Aspen Parkland field guide provided at this stop, identify the following two (2) plants. (1 pt. each)

Plant A: _____ (Hint – Plant A can be found under the Aster family)

Plant B: _____ (Hint – Plant B can be found under the Grass family)

Answer: a) *Philadelphia Fleebane* b) *Timothy*

Source: Plants of the Western Boreal Forest and Aspen Parkland

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STOP 7**Aquatics (7) – 2 points**

Write the word equation for photosynthesis.

_____ + _____ + _____ = _____ + _____

Answer:

Carbon dioxide + water + light = glucose + oxygen

Source: “Water as Environment”

Alternative or Renewable Energy (7) – 2 points

Circle the correct responses. (1 pt. each)

A. How much of Canada’s electricity is generated from Hydropower?

45% 50% 55% 60% 65%

B. How much of Ontario’s electrical power comes from nuclear?

35% – 40% 41% - 45% 46% - 50% 51% - 55%.

Answers:

A. 60%

B. 51-55%

Source: Manitoba Envirothon 2007 Theme Guide p. 17 & p. 20

Forestry (7) – 2 points

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

A. The largest source of pollution entering a watercourse from forest harvesting operations is from _____ . (1 pt.)

B. Circle the best response. The BMP principle behind reducing the effects of this sediment is to: (1 pt.)

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

Answers:

A. access roads

B. d

Source: Buffer Mngt Report

Soils (7) – 2 points

What are two (2) negative effects of soil compaction on the plant-soil system? (1 pt. each)

_____ and _____

Answers: Any 2 of the following

- *Reduces water infiltration*
- *Reduces air movement in soil*
- *Reduces seedling emergence*
- *Restricts root growth*
- *Reduces crop yield*

Source: Soil Compaction

<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s10.html>

Wildlife (7) – 10 points

EQUIPMENT PROVIDED

A. Name any four (4) specific needs for which a coyote seeks in its habitat. (1 pt. each)

1) _____

2) _____

3) _____

4) _____

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B. Name three (3) specific adaptations or features of a wolf which make it better suited than a coyote to the habitat in which it lives and briefly explain how this adaptation make wolves better suited than coyotes. (2 pts. each)

1) _____

2) _____

3) _____

Answers:

A. Any 2 of the following

- Open/prairie areas
- Forest or bush (“trees” – only 1pt!)
- Forest or bush edge
- Water
- Plants
- Any small animal (mammals, birds, insects)
- Any dead animal (mammals, birds, insects)
- Deer

B. Any 3 of the following (2pts each; 1pt each if only answer using phrases in brackets)

- Long legs (to cope with deep snow)
- Large feet (to cope with deep snow)
- Large body (to deal with larger prey, especially moose)
- Large teeth (to deal with larger prey, especially moose)
- Large Jaws (to deal with larger prey, especially moose)
- Large muscles (to deal with larger prey, especially moose)
- Large skull (to deal with larger prey, especially moose)
- Long/thick/2-layered hair (to deal with cold temperatures)

Source: April Workshop

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STOP 8**Aquatics (8) – 2 points****EQUIPMENT PROVIDED**

Match the fish part with the correct letter on Diagram A provided at this stop. (0.5 pt. each)

_____ caudal fin _____ pectoral fin
 _____ adipose fin _____ dorsal fin

Answer: *E = caudal fin* *H = pectoral fin*
 D = adipose fin *C = dorsal fin*

Source: Fish Anatomy

Alternative or Renewable Energy (8) – 10 points

10

A. What are the three (3) forms biomass energy can take? Provide two (2) examples of each form. (3 pts. – 1 pt each)

1) _____

2) _____

3) _____

B. List three (3) processes of converting biomass into useable energy. (3 pts – 1 pt. each)

1) _____

2) _____

3) _____

C. What is a biogas generator? (1 pt.) _____

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How does it work? (1 pt.) _____

D. Provide two (2) differences in the characteristics of bioethanol and biodiesel fuels?
(2 pts. – 1 pt. each)

1) _____

2) _____

Answers:

A. *gaseous (biogas/methane), liquid (alcohol-based and oil-based biofuels), solid (wood, straw, manure, household/commercial waste) ,*

B. *combustion, gasification, liquefying*

C. *Biogas generators are used to create methane. Plant materials and animal wastes are mixed with water. Existing bacteria digest the feedstock and produce biogas, which rises to the top and is collected in storage tanks. When the bacterial process slows, the process is repeated. Any leftover waste material can then be used as natural fertiliser*

D. *Ethanol uses sugars and starches to produce alcohol while biodiesel is composed of oils from plants or animals. Ethanol is produced via fermentation while biodiesel is produced via transesterification. Ethanol is used mainly in gasoline engines while biodiesel can only be used in diesel engines. Currently, ethanol must be mixed with gasoline (up to E85, but usually E10) while biodiesel can be used in its pure form (B100). Ethanol production has numerous by-products while biodiesel production results mainly in fuel and glycerine.*

Sources: Envirothon 2007 Theme Guide, p. 31
Developing Manitoba's Ethanol Industry, 2006
Biodiesel: Made in Manitoba, 2005, p. 6 and Appendix "A"

Forestry (8) – 2 points

Why are Pre-Harvest Surveys performed?

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Answers: Identifies values in an attempt to mitigate impacts of forest management activities on sensitive sites, waterways, wetlands, wildlife and their habitat and conserve biodiversity.

Source: pH Surveys/MC Forest Practices Website.

Soils (8) – 2 points

Legumes are capable of fixing their own nitrogen, so they are often included in crop rotations to build soil fertility. Soil nutrient tests are not capable of assessing the amount of nitrogen available for the next crop; known as the fertilizer replacement value (FRV). To determine this amount more accurately, there is a recommended method to determine the FRV.

Describe this test.

Answer:

The year following the legume crop, a non legume test crop is grown on the land which had legumes. The yield of that crop is compared to the yield of the same type of crop grown on test strips with different fertilizer rates. (Example: 0, 40 80, 120 lb. nitrogen/ac)

Source: University of Manitoba: Natural Systems Agriculture
<http://www.umanitoba.ca/outreach/naturalagriculture/covercrops.html>

Wildlife (8) – 2 points

Why is it important for beavers to always gnaw woody plants, especially trees?

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Answer: Beavers gnaw on the bark of trees, which help keeps their teeth worn down. The also grind their teeth to sharpen them. Both are important since beaver's teeth are constantly growing.

Source: Reference: Fur Bearers of Canada, page 1

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STOP 9**Aquatics (9) – 2 points**

EQUIPMENT PROVIDED

What is the name of the flagged area at this stop? (0.5 pt.) _____

Using the field guide to aquatic plants provided at the stop, identify the plant species in Diagram A, the plant category it belongs to and one value it provides to the fish community. (1.5 pts. – 0.5 pt. each)

Plant species: _____

Plant category: _____

Value to fish community: _____

Answer: littoral zone

Plant species: floating-leaf pondweed

Plant category: submersed plants

Value: (1 of the following) – shade and foraging opportunities.

Source: “Through the looking glass: a field guide to aquatic plants”

Alternative or Renewable Energy (9) – 2 points

What is meant by **environmental justice**?

Answer:

Fair treatment and meaningful involvement of all people with respect to the development, implementation and enforcement of environmental laws, regulations and policies.

Source: Manitoba Envirothon 2007 Theme Guide p. 44

Forestry (9) – 10 points

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EQUIPMENT PROVIDED

10

A. Using the Field Guide provided or your own general knowledge, please identify these native tree species, using either the common or scientific name: (8 pts. – 2 pts. each)

a) _____

b) _____

c) _____

d) _____

B. Identify a non-traditional forest product made from one (1) of these species. (2 pts.)

Answers:

- A. a) *Red Pine*
 b) *Manitoba Maple*
 c) *Bur Oak*
 d) *Balsam Fir*

B. *maple syrup, (check field guide descriptions for more)*

Source: guide keys for twigs or conifers, workshop training, MFA, MC websites

Soils (9) – 2 points

Available water is the term for the water held in the soil that plants can use. It is the difference between the **permanent wilting point** and **field capacity**. Define these terms. (1 pt. each)

Permanent Wilting Point: _____

Field capacity: _____

Answers:

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Permanent wilting point: Soil water content at which plants can no longer extract water, and at which plants cannot recover from wilting. (Often considered to be at 15 bars of soil suction.)

Field capacity: Maximum amount of water held in the soil after free drainage has ceased. Usually considered to be the amount of water left in the soil after two days of drainage, from when a soil is initially saturated.

Source: Water Use and Moisture Management/ pg 37
<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s04.html>

Wildlife (9) – 2 points

Wetlands are everywhere. They are found along oceans, lakes and rivers. Name the four (4) major types of wetlands. (0.5 pt. each)

Answer: ponds, marshes, swamps, and peatbogs

Source: Hinterland Who's Who – Wetlands, page 107

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STOP 10**Aquatics (10) – 2 points****EQUIPMENT PROVIDED**

Using the O₂ and pH meter provided, answer the following questions.

A. What are the oxygen and pH readings at this site? (1 pt. – 0.5 pt. each)

Oxygen = _____ pH = _____

B. What is the range that pH should be for fish? (0.5 pt.) _____

C. What is the relationship between oxygen and temperature? (0.5 pt.) _____

Answers:

A. **TBD at trail site**

B. 6 – 9.5 or 6.5 - 8.2

C. Cold water holds more oxygen than warm water.

Source: Aquatics Binder

Alternative or Renewable Energy (10) – 2 points

Define **Primary** and **Secondary Energy**. (1pt. each)

Primary energy: _____

Secondary energy: _____

Answer: Primary energy includes raw sources before being transformed into commercial use. Examples include crude oil and uranium. **Secondary energy** is commercial energy sold to consumers for residential, agricultural, commercial, industrial and transportation use. Examples include gasoline and electricity.

Source: Manitoba Envirothon 2007 Theme Guide p. 23

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Forestry (10) – 2 points

What is the East Side Lake Winnipeg Planning Initiative and what is its goal? (1 pt. each)

Answer: A pilot project on the East Side of Lake Winnipeg intended to fully integrate land, environmental, social, cultural and economic planning systems while maintaining ecosystem functions and integrity. Involves all stakeholders (particularly First Nations) in the LGD's,

Source: Next Steps

Soils (10) – 2 points

Describe two (2) management strategies for farming dry soils that will help conserve soil moisture.

(1 pt. each)

- 1) _____
- 2) _____

Answers: Any 2 of the following

- *Avoid summerfallowing*
- *Use reduced tillage or zero tillage*
- *Leave crop residue on the surface*
- *Use snow trapping techniques such as shelterbelts or standing stubble, or annual barriers*

Source: Water Use and Moisture Management

<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s04.html>

Wildlife (10) – 10 points

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10

A. List five (5) differences between a salamander and a lizard. (2 pts. each)

Salamander	Lizard
1.	
2.	
3.	
4.	
5.	

Answers:

<i>Salamander</i>	<i>Lizard</i>
<i>Amphibian</i>	<i>Reptile</i>
<i>Found in cool wet areas</i>	<i>Found in dry desert areas</i>
<i>Smooth body</i>	<i>Scaly body</i>
<i>Lays eggs in water</i>	<i>Lays eggs in dirt and under leaves</i>
<i>Shell less eggs</i>	<i>Hard shell eggs</i>
<i>Breaths through its skin and lungs</i>	<i>Breaths through its lungs</i>
<i>Limbs grows back</i>	<i>Limbs do not grow back</i>
<i>Has no claws</i>	<i>Has claws</i>

Source: April Workshop

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STOP 11**Aquatics (11) – 2 points****EQUIPMENT PROVIDED**

Identify the equipment found at this stop. (1 pt. each)

a) _____

b) _____

Answer: A) D-net B) Seine

Source: April 2007 Workshop

Alternative or Renewable Energy (11) – 2 points

Why are certain emissions referred to as “Green House Gases”?

Answer: Accumulate in the atmosphere and contribute to climate change by heating the earth's surface.

Source: Manitoba Envirothon 2007 Theme Guide p. 26

Forestry (11) – 2 points

Circle the best responses. (1 pt. each)

A. Forest Certification has been established in Canada for:

- a) 2 years
- b) 8 years
- c) 28 years
- d) 82 years

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B. How many hectares of land are certified in Canada?

- a) Just over 1 million hectares
- b) Just over 12 million hectares
- c) Just over 123 million hectares
- d) Just over 1.234 billion hectares

Answers:

A. b. 8 years

B. c. 123 million hectares

Source: “What buyers need to know” – FPAC document page 3

<http://www.metafore.org/index.php?p=About+Certification&s=153> titled “About Certification”

Source: <http://www.certificationcanada.org/english/index.php>

Soils (11) – 10 points

EQUIPMENT PROVIDED

10

A. A producer intends to grow silage corn. Last fall soil samples were taken to a depth of 24” (60 cm) and submitted to a laboratory for analysis. The results yielded a result of 30 lb/ac NO₃-N. The farmer has set a target yield of 17.1 t/ac.

What is the nitrogen recommendation based on the *Manitoba Soil Fertility Guide* (assuming a spring band application)? (2 pts.)

B. Urea is 46% N (weight for weight basis) and retailed in the spring of 2007 at \$560.00/t.

What is the cost of **actual** N expressed on a per pound basis? (2 pts.)

C. What is the cost of the recommended amount of N fertilizer? (2 pts.)

D. What is the difference between traditional composite random soil sampling and benchmark soil sampling? (2 pts.)

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E. What is 'residual nitrogen' and why is it a concern? (2 pts.)

Answers:**A.** 145 lb/ac**B.** \$0.55/pound**C.** 145 lb/ac * \$0.55/lb. = \$80.08/ac

D. Benchmark soil sampling uses a small area which typifies the field. From this area, 15-20 samples are randomly collected and mixed together. In traditional composite random sampling, 15-20 cores are randomly taken throughout a field, thoroughly mixed, subsampled and sent to the lab as a single sample. Representative areas should be sampled when using this approach.

E. Residual nitrogen is the different between the amount of nitrogen available to the growing crop and the amount removed in the harvested crop. Inputs of nitrogen greater than what is recommended can contribute to water quality problems and greenhouse gas emissions.

Source: Calculation, Spring Workshop 2007 and Soil Fertility Guide, pages 31-32.

Wildlife (11) – 2 points

List two (2) types of birds that need the excellent escape cover of wetlands while moulting.

1) _____

2) _____

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Answer: Mallards and teals, geese and ducks, any marsh bird

Source: Hinterland Who's Who – Wetlands, page 109

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STOP 12**Aquatics (12) – 2 points****EQUIPMENT PROVIDED**

Use the fish key provided at the stop to identify the four (4) fish to species (common or scientific name). (0.5 pt. each)

- a) _____ b) _____
c) _____ d) _____

Answer:

- A. **TBD**
B. **TBD**
C. **TBD**
D. **TBD**

Source: April Workshop

Alternative or Renewable Energy (12) – 2 points

List two (2) of the direct effects of resource use or extraction for energy production. (1pt. each)

- 1) _____
2) _____

Answers: Deplete resource reserves, Cause habitat destruction or flooding, Changes in biodiversity

Source: Manitoba Envirothon 2007 Theme Guide p. 25

Forestry (12) – 2 points

Some pulp and paper mills have a cogeneration plant as part of their facility where they burn left over bark, wood shavings, or sawdust. Why do they do this?

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***Answer:** Biomass is a clean, green, carbon-neutral energy source derived from industrial by-products such as bark, wood shavings and sawdust. Canada's pulp and paper sector currently meets 60% of its energy demands with this renewable energy source.*

Source: Renewable Energy in the Forest Products Industry Fact Sheet, page 1

Soils (12) – 10 points

10

List five (5) benefits of cover crops. (2 pts. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____

Answers: Any 5 of the following

- *Adding organic nutrients*
- *Utilizing excess nutrients after regular season cropping*
- *Reducing soil erosion*
- *Improving soil quality*
- *Suppressing weed growth*
- *Using excess soil moisture*
- *Increasing soil organic matter*
- *Improving water holding capacity*
- *Improving root development potential*

Sources:

Using Green Manures in Potato cropping systems/ Washington State University

<http://cru.cahe.wsu.edu/CEPublications/eb1951e/EB1951E.pdf>

University of Manitoba: Natural Systems Agriculture

<http://www.umanitoba.ca/outreach/naturalagriculture/covercrops.html>

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Wildlife (12) – 2 points

Name two (2) adaptations or features that reflect the typical anatomy of a shorebird.
(1 pt. each)

- 1) _____
- 2) _____

Answer: long legs, long bill or long wings

Source: Hinterland Who's Who – Shorebirds Fact Sheet

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STOP 13**Aquatics (13) – 2 points**

A. Name two (2) processes of the water cycle that result in water vapour entering the atmosphere. (1 pt. – 0.5 pt. each)

1) _____

2) _____

B. Name two (2) human activities that have severely altered the nitrogen cycle. (1 pt. – 0.5 pt. each)

1) _____

2) _____

Answers:

A. transpiration and evaporation

B. Any 2 of the following

- *Application of nitrogen fertilizers*
- *Fossil fuel combustion and forest burning*
- *Livestock ranching*
- *Sewage waste and septic tank leaching*

Source: “The Water Cycle” and “The Nitrogen Cycle”

Alternative or Renewable Energy (13) – 2 points

Define **alternative energy** and **renewable energy**. (1 pt. each)

Alternative energy: _____

Renewable energy: _____

Answers:

Alternative energy: Energy source that that supplements or replaces conventional energy

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Renewable Energy: Energy that can be quickly replaced through natural processes or renewed through human intervention

Source: Manitoba Envirothon 2007 Theme guide p. 30

Forestry (13) – 2 points

Imagine this open field is planted with young willow or hybrid poplar. What would be two (2) purposes of this kind of plantation?

1) _____

2) _____

Answer: This crop is a biomass source for alternative energy – for burning in cogeneration plants but is also being investigated for a variety of uses, such as a source of ethanol.

Source: Field day training session – St. Leon, general knowledge

Ethanol from Wood: Through a process called "enzymatic hydrolysis," enzymes attack cellulose and convert forest residues (e.g., chips and sawdust) into sugar. The sugar is then refined into ethanol. Used as a partial replacement for regular gasoline, ethanol-blended fuel produces fewer greenhouse gas emissions than regular car fuel.

Sources: http://cfs.nrcan.gc.ca/sof/sof99/feat2_e.html

<http://web.extension.uiuc.edu/forestry/agroforestry.html>

http://www.climatechangeconnection.org/pages/subpages/35mto_ethanol.html

Soils (13) – 10 points

EQUIPMENT PROVIDED

10

A. Soils are required for food production and water filtration. How much of the earth's surface has soil that is suited to growing crops? Check the correct response. (1 pt.)

1/32 1/20 1/16 1/8

B. What is the size of the silt fraction? Check the correct response. (1 pt.)

2.0 -.05 mm .05-.002mm less than .002mm

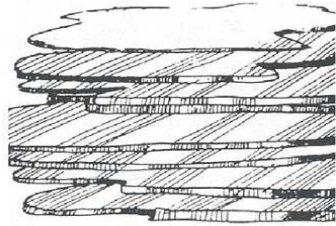
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C. Using the sample provided and the Texture By Feel Guide, give the texture of the two (2) samples. (6 pts. – 3 pts. each)

1) _____

2) _____

D. Name the two (2) types of soil structure found below. (2 pts. – 1 pt. each)



1) _____



2) _____

Answers:

A. 1/16

B. 0.5-0.02 mm

C. TBD at trail test

D. 1. platy

2. columnar or prismatic

Sources:

Understanding the Soil Landscapes in Manitoba, Page 2.

<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s02.html>

Soil Management Guide, page 7.

Understanding the Soil Landscapes in Manitoba / training session

<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s02.html>

Canadian System of Soil Classification

<http://sis.agr.gc.ca/cansis/taxa/cssc3/index.html>

Wildlife (13) – 2 points

Name two (2) major factors affecting the population dynamics of wildlife species.
(1 pt. each)

_____ and _____

Answer: Birth rate and Death Rate

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Source: Ecology and Wildlife Management, page 15 and 16

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STOP 14**Aquatics (14) – 2 points**

List two (2) conditions or events caused by human activities affecting the atmosphere that have major impacts on boreal lakes and streams. (1 pt. each)

1) _____

2) _____

Answer: Any 2 of the following

- *acidic precipitation*
- *climatic warming*
- *increased UV radiation because of stratospheric ozone depletion*
- *increased mercury deposition because of mercury releases to atmosphere*

Source: CD/binder A.18 “Sustaining Aquatic Ecosystems in Boreal Regions”

Alternative or Renewable Energy (14) – 2 points

List four (4) types of biomass used for energy production. (0.5 pt. each)

1) _____

2) _____

3) _____

4) _____

Answer: *wood, crops, garbage, landfill gas, alcohol fuels*

Source: Manitoba Envirothon 2007 Theme Guide p. 33

Forestry (14) – 10 points**EQUIPMENT REQUIRED**

A. Trees can be aged using the piece of forestry equipment on the table. Name it:

_____. (2 pts.)

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B. The samples provided were extracted from a white spruce tree. Please determine the tree's age. (Use any sample and the hand lens and pointer if necessary.)

Sample: _____

Age: _____ years old (2 pts.)

C. Circle the correct response. **Dendrochronology** refers to: (2 pts.)

- a) the time of year that leaves form on trees
- b) the study of plant evolution
- c) the analysis of tree growth ring patterns in science
- d) the difference in plant growth from one area to another

D. Circle the correct response. Dendrochronological timelines can be used by researchers to: (2 pts.)

- 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

E. True or False. Circle the correct response. Tree ring width can be affected by both biotic and abiotic factors. (2 pts.)

True

False

Answers:

A. *increment borer*

B. **TBD at trail site** (+/-3 years = 2 pts, +/- 5 years = 1 pt)

C. *c*

D. *d*

E. *true*

Sources:

A and B: Event Training

C, D and E::Henri D. Grissino-Mayer's Ultimate Tree-Ring website

Soils (14) – 2 points

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Match the correct term to the correct definition (1 pt. each)

A. Soil particle movement by wind, as rolling or sliding along the surface is _____.

a. suspension

b. surface creep

B. Soil movement in a bouncing pattern which dislodges other particles on impact is _____.

c. saltation

Answers :

A. b

B. c

Source: Soil Management Guide, Page 80.

Wildlife (14) – 2 points

Give two (2) examples of how antlers and horns are used by animals. (1 pt. each)

1) _____

2) _____

Answer: *Antlers and horns are used in mating displays, defense and protection from predators and in foraging for food.*

Source: Antlers, Horns and Teeth, page 38 or Skulls in Education, page 43.

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STOP 15**Aquatics (15) – 2 points**

Which of the following statements accurately describe water as a substance? Circle the letters that represent correct statements.

- a) Is present as a solid, liquid, and gas within a range of 100 Celsius degrees
- b) Its molecule is bipolar, consisting of one oxygen and two hydrogen atoms
- c) Has a very low surface tension in its liquid form
- d) Dissolves almost everything, at least to some degree
- e) Has one of the lowest heat capacities of any substance
- f) Is difficult to find in nature in its pure form
- g) Is twice as viscous at 30° C as at 0° C
- h) Filters out blue and green light more rapidly than red light

Answers: a, b, d, f

Source: CD/Binder A1. "Water as Environment"

Alternative or Renewable Energy (15) – 10 points

10

A. What are three (3) different applications for wind power? (3 pts – 1 pt. each)

- 1) _____
- 2) _____
- 3) _____

B. List and describe the four (4) key components of a wind turbine at St. Leon (4pts. – 1 pt. each)

- 1) _____

- 2) _____

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3) _____

4) _____

C. Describe the role of wind power for electricity generation in Manitoba. Indicate the current wind generation capacity, the relationship between wind generation and other forms of electric generation in Manitoba. (3 pts.)

Answers:

A. *Transportation – sailing ships, Mechanical energy – grinding grain, pumping water, Electrical energy – power generation*

Source: Envirothon 2007 Theme Guide, p.29

B. *1: Rotor - a hub with 3 blades that converts wind energy into shaft energy
2: Nacelle - contains drive train, gearbox & generator
3: Tower - supports nacelle and is 80 meters high
4: Electronic Controls – controls the electric power generation and the operation of the wind turbine*

Source: presentation at April Workshop

C. *Manitoba currently has the capacity for 99 MW from wind generators tied to the utility grid. Wind energy is highest during the daytime and drops at night. Wind energy must be very efficient to compete with hydro-electric generation as Manitoba's hydro power is the cheapest in North America. Wind energy can be used to supplement power and create opportunities for additional growth and export sales. Wind energy requires accurate forecasts to predict potential contributions to the electrical grid.*

Source: presentations at April Workshop

Forestry (15) – 2 points

A. What are two (2) important components of a forest plant community that can be measured by quadrant sampling? (1 pt. – 0.5 pt. each)

1) _____

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2) _____

B. Name two (2) forest strata are commonly sampled by this method? (1 pt. – 0.5 pt. each)

1) _____

2) _____

Answer:

A. Cover (percent cover), density (stems per quadrat) and frequency (% of presence across all quadrats).

B. The forest strata commonly sampled by this method are the herb, shrub and tree strata.

Source: Forest Plant Sampling

Soils (15) – 2 points

A. Describe **tillage erosion** (1 pt.) _____

B. Describe **landscape restoration** of eroded fields (1 pt.) _____

Answers:

A. Tillage erosion is the term describing the redistribution of topsoil within a field by tillage, from the higher knoll positions to the lower slope and depressional areas.

B. This is the practice of moving some of the accumulated topsoil from the depressional areas back onto the knolls, to restore productivity of the knoll and to reduce crop yield variability in the field.

Source: Soil Management Guide, page 89.

Wildlife (15) – 2 points

List four (4) things that we could do to help manage the salamander's population.
(0.5 pt. each)

1) _____

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2) _____

3) _____

4) _____

Answer: Any 4 of the following

- *Fence around ponds and lakes*
- *Maintain water level*
- *Create ponds to compensate for lost breeding habitats*
- *Protect grass lands*
- *No game fish*

Source: April Workshop

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ASSINIBOINE TRAIL**STOP 16****Aquatics (16) – 2 points**

A. What is the temperature at which water reaches its maximum density? (0.5 pt)

B. Why is this unusual? (0.5 pt)

C. Why is this special property of water so important for life in Canadian lakes during the winter season? (1 pt)

Answers:

A. 4° C

B. *the solid form (ice) is less dense than the liquid form*

C. *ice forms at the surface rather than from the bottom up, thereby permitting life to continue in liquid water under the ice and sheltered by it from harsh winter conditions*

Source: CD/Binder A1. "Water as Environment"

Alternative or Renewable Energy (16) – 2 points

Biogas is a natural gas composed of _____ and _____.
(1 pt. each)

Answer: *Biogas is a natural gas composed of Methane and Carbon Dioxide*

Source: Manitoba Envirothon 2007 Theme Guide p. 32

Forestry (16) – 2 points

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What are two (2) reasons for using quadrant sampling to sample a forest plant community?
(1 pt. each)

1) _____

2) _____

Answer: Possible reasons for sampling are to determine the biodiversity of an area, to assess the success of a re-vegetation or restoration project, to compare the effects of human disturbance to natural disturbance (i.e. harvest vs. wildfire), or to simply describe a natural area of interest (i.e. a protected area).

Source: Forest Plant Sampling

Soils (16) – 2 points

A. A high C:N ratio in crop residue results in _____ of soil N.
(1 pt.)

B. The ultimate authority to regulate land use in Manitoba is vested with municipalities. Municipalities may enact development plans and zoning by-laws to plan for and regulate land use and the location and operation of developments in accordance with _____.
(1 pt.)

Answers:

A. Immobilization

B. The Planning Act

Source: Soil Management Guide, Page 102, 111.

Wildlife (16) – 10 points

10

This grassy area is prime habitat for the Richardson's ground squirrel. The ground squirrel is part of the rodent family. Currently, this one square kilometre area has 100 ground squirrels. The area can support up to 200 ground squirrels.

Assumptions:

The current ground squirrel population is 60 percent females and all the females have babies. Ground squirrels give birth to an average of seven babies per litter per year; of which 60 percent are females. In each litter, one (1) male does not survive after birth.

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Every time an animal is born, it's added to the population. When a ground squirrel dies, it's subtracted from the population.

In order to maintain the Richardson's ground squirrel population of 200 for this one square kilometre area after the first year, how many would either have to move out of the area or be consumed by predators?

Answer = _____

Answer: 260

Source: Chapter 1 – Wildlife Populations

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STOP 17**Aquatics (17) – 2 points**

What are the two (2) main types of aquifers in terms of their physical attributes? Give one (1) example of a possible material type for each. (0.5 pt. each)

Type	Example
1.	
2.	

Answer:

<i>Type</i>	<i>Example</i>
<i>1. porous</i>	<i>Gravel, sand</i>
<i>2. fractured</i>	<i>Granite, basalt, limestone</i>

Source: CD/Binder A4. “The Nature of Water: Groundwater”

Alternative or Renewable Energy (17) – 2 points

Is hydro power considered conventional energy? If yes, why? If no, why not?

Answer: *Yes. It captures a large share of and a long history of the energy market.*

Source: Manitoba Envirothon 2007 Theme Guide p. 30

Forestry (17) – 2 points

A. Define biodiversity. (1 pt.)

B. What typically happens to the biodiversity of a forest immediately following a disturbance (such as wildfire)? (0.5 pt.)

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C. And then as time passes? (0.5 pt.)

Answer:

A. Biodiversity is the number and proportion of different types of organisms in a given area or habitat.

B. After a disturbance, diversity tends to be very low.

C. As time progresses and the habitat becomes more conducive to plant growth, then more species establish and the diversity increases.

Source: Forest Plant Sampling

Soils (17) – 2 points

A. Detailed soil survey maps are much more accurate and reliable for making decisions at the _____ level. (1 pt.)

B. Of the following map scales, which would be the most detailed? Circle the correct response. (1 pt.)

a) 1:1,000,000

b) 1:125,000

c) 1:50,000

d) 1:20,000

Answers:

A. On-farm or municipal decision level; 1:20,000

B. d – 1:20,000

Source: Soil Management Guide, Page 24.

Wildlife (17) – 10 points

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EQUIPMENT PROVIDED

A. A scientist can tell a lot about an animal's diet by looking at their jaw and teeth. Closely examine the five (5) jaws and identify whether the animal is a carnivore, herbivore or omnivore based of the differences in dentition (teeth). (5 pts. – 1 pt. each)

Jaw	Carnivore - Herbivore - Omnivore
A	
B	
C	
D	
E	

B. Now, using your knowledge of furbearing animals, identify the following pelts:
(5 pts. – 1 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____

Answers:**A.**

Jaw	Carnivore - Herbivore - Omnivore
A – Skunk	Omnivore
B – Bobcat	Carnivore
C – Rabbit	Herbivore
D – Polar Bear	Carnivore
E – Porcupine	Herbivore

B.

1. Arctic fox
2. Lynx
3. Muskrat
4. Mink
5. Beaver

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Team #

Source: April Workshop

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STOP 18**Aquatics (18) – 2 points**

Increased development leads to increased impervious surfaces and an increase in runoff laden with sediment. List four (4) effects of increased sedimentation in the receiving waterbody. (0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answer: Any 4 of the following:

- *reduce amount of sunlight for aquatic plants*
- *increases water temperature*
- *covers fish spawning areas*
- *cover food supplies*
- *clogs fish gills*
- *carries other pollutants (phosphorus, heavy metals, pathogens)*

Source: Non-point source pollution: managing non-point source pollution from agriculture.

Alternative or Renewable Energy (18) – 10 points

10

A. Define **Geothermal Energy**. (1pt.) _____

B. Describe the four (4) primary types of “loops” used for geothermal heat pump installations (2 pts. – 0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

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C. Describe the cooling cycle of geothermal pump installed in a house using a diagram.
(5 pts.)

D. Identify two (2) pros and two (2) cons of the geothermal heat pump technology.
(2 pts. – 0.5 pt. each)

Pros	Cons

Answers:

A. *energy from the internal heat of the earth.*

Source: Presentation at April Workshop

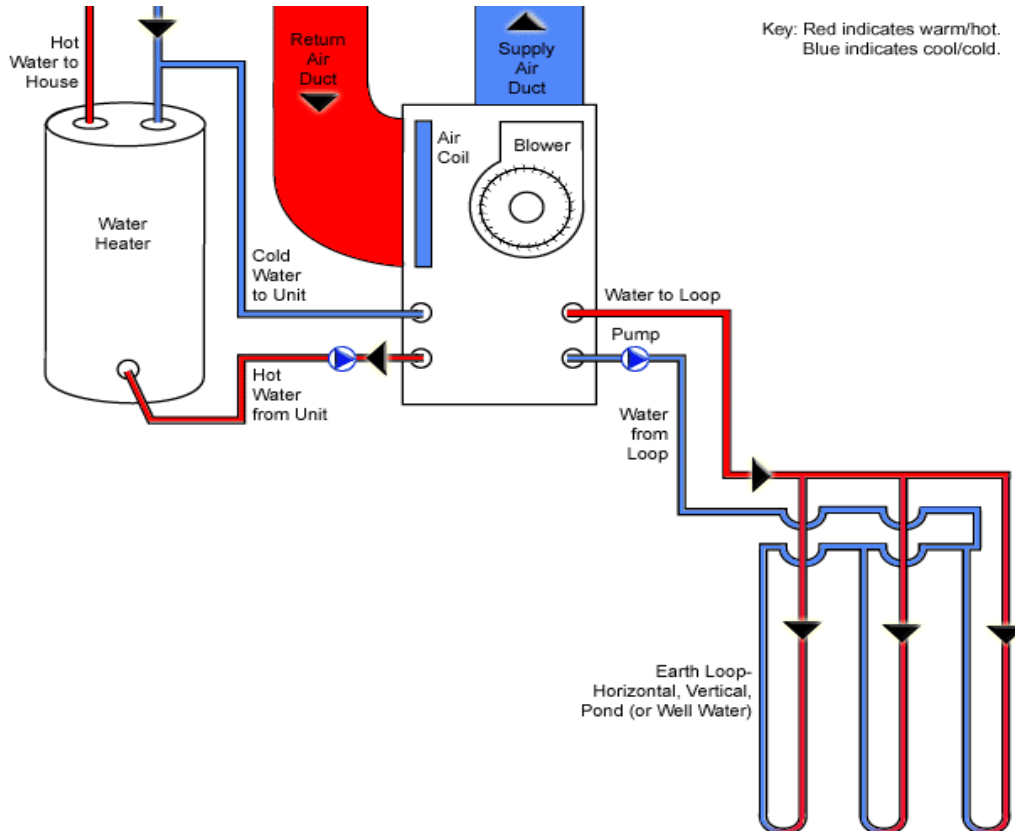
B. *There are four primary types of loops, namely,*

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- *Open loop (well water system)*
 - 1 *least expensive to install*
 - 1 *Water quality/quantity important*
- *Horizontal loop (backhoe, trencher, horz. bore)*
- *Vertical loop (drill rig)*
- *Pond/lake loop*

Source: Presentation at Workshop, Envirothon 2007 Theme Guide

C.



Source: Presentation at April Workshop

D. **Pros** – lower operating costs, reduction in GHG emissions, provides heating and cooling from the same unit.

Cons – potential for contamination of surrounding soil and water from circulating fluid, higher setup costs.

Source: Manitoba Envirothon 2007 Theme Guide, Presentation at April Workshop

Forestry (18) – 2 points

Suppose a forest community is sampled for tree composition, and it is determined that the site sampled has a Simpson's diversity value of 1.0.

A. What does that tell you about the plant community? (1 pt.)

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B. What is the range of values for this diversity index? (1 pt.)

Answer:

A. The plant community has a very low diversity (only one species is present).

B. Simpson's diversity values range from 1 to infinity.

Source: Forest Plant Sampling

Soils (18) – 2 points

A. Soils that have a very high clay content and shrinks and cracks in dry periods, allowing cracks to fill with topsoil belong to the _____ order. (1 pt.)

B. Where in Manitoba would one expect to find these soils? (1 pt.)

Answers:

A. Vertisolic

B. Red River Valley

Source: Manitoba Soil Sustainability in the 21st Century, page 3

Wildlife (18) – 2 points

What body behaviour/display do salamander's use to scare off their predators?

Answer: When a salamander feels threatened it will raise its head and tail to make it look bigger.

Source: April Workshop

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STOP 19**Aquatics (19) – 2 points**

List four (4) key ecological functions of healthy riparian areas (2 pts. – 0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answer: Any 4 of the following

- *trap sediment*
- *build and maintains streambanks*
- *store floodwater and energy*
- *recharge groundwater*
- *filter and buffer water*
- *reduce and dissipate stream energy*
- *maintain biodiversity*
- *create primary productivity*

Source: Managing the Water's Edge (p. 9)

Alternative or Renewable Energy (19) – 2 points

Solar Power and Wind Generation are forms of alternative and renewable energy. List four (4) other forms of alternative and renewable energy. (0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answer: *Biomass energy, Geothermal energy, Tidal and Wave Generation, Hydrogen fuel cells*

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Source: Manitoba Envirothon 2007 Theme Guide p. 30

Forestry (19) – 2 points

Describe the appearance (relative width) of yearly growth rings from trees growing in locations where: (0.5 pt. each)

a) there is a year in which there is an extreme drought in the middle of the growing season;

b) there is a year in which spruce budworm defoliates many branches;

c) there is a dense understory of shrubs during the early phases of the tree's life;

d) fire or logging removal reduces the population density at a certain age.

Answers: a. Decreased growth; b. Decreased growth; c. Decreased growth; d. Increased growth

Source: Forest Plant Sampling

Soils (19) – 10 points

10

True or False? Place a **T** or **F** beside each statement accordingly to indicate whether that statement is **True** or **False**. (1 pt. each)

_____ Wind erosion decreases as soil dries.

_____ A 30 mph wind has more than 3 times more erosive power than a 20 mph wind.

_____ Pulse crops are usually grown on soils which are least prone to wind erosion.

_____ The maximum tolerable soil loss is .75mm, or 5 tons/acre/year.

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- _____ Annual barriers should be planted parallel to the prevailing winds.
- _____ The most susceptible period for soil erosion by water is during the fall.
- _____ Flat stubble is more effective at preventing water erosion than standing stubble.
- _____ Coarse textured soils are more susceptible to water erosion than fine textured soils.
- _____ Perennial forage crops are a better crop to grow than cereals on water erosion prone soils.
- _____ As topography increases in slope from 9% to 15%, the amount of cover required to protect against water erosion decreases from 70% to 50%.

Answers:

F, T, F, T, F, F, T, F, T, F

Source : Soil Management Guide, Pages 82-87

Wildlife (19) – 2 points

List any two (2) general needs/requirements that make up an animal's habitat. (1 pt. each)

Answer: Any 2 of the following

- *Food*
- *Water*
- *Shelter*
- *Space*
- *Air*

Source: April Workshop & pg 11 of Wildlife Binder

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STOP 20**Aquatics (20) – 2 points**

A. Name two (2) processes of the carbon cycle that result in carbon dioxide entering the atmosphere. (1 pt. – 0.5 pt. each)

1) _____

2) _____

B. Where does phosphorus eventually end up? (1 pt.) _____

Answers:***A. Any 2 of the following***

- *Respiration*
- *Decomposition*
- *burning fossil fuels*

B. bottom of the ocean

Source: “The Carbon Cycle” and “The Phosphorus Cycle”

Alternative or Renewable Energy (20) – 2 points

What percent ethanol is mandated in vehicle fuels by the Manitoba Government? _____%

Answer: 10%

Source: April Workshop

Forestry (20) – 10 points

10

A. What do you call items of value taken from natural forest that are useful but not used for lumber? (1pt.)

B. Give three (3) examples of the above. (3 pts. – 1 pt. each)

1) _____

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2) _____

3) _____

C. What is Traditional Ecological Knowledge and who is the primary holder of TEK in Canada? (3 pts.)

D. Why is TEK sometimes referred to as “Traditional Science”? (3 pts.)

Answers:

A. Non-Timber Forest Products (or Non-traditional Forest Products) ½ point for NTFP

Source: <http://www.modelforest.net/cmfn/en/>,
& <http://www.gov.mb.ca/conservation/wno/status-report/glossary.pdf>

B. Syrup, soap, tea, berries, canoes, medicine, crafts, etc.

Source: <http://www.nfdc.ca/about.htm>, and field day training – St. Leon

C. TEK is the knowledge base acquired by indigenous and local peoples over many hundreds of years through their direct contact with the environment. This knowledge includes an intimate and detailed knowledge of plants, animals and natural phenomena, the development and use of appropriate technologies for hunting, fishing, trapping, agriculture and forestry, and a holistic knowledge, or “world view”, which parallels the scientific discipline of ecology.

Source: <http://www.modelforest.net/cmfn/en/>
& <http://www.gov.mb.ca/conservation/wno/status-report/glossary.pdf>

& Field day training session – St. Leon, general knowledge

D. TEK follows same principles as science: Theory, Data collection, Observation, and Conclusions, used to make decisions (2 points for principles, 1 for decisions)

Source: Field day training session – St. Leon, general knowledge
& <http://www.gov.mb.ca/conservation/wno/status-report/glossary.pdf>

Soils (20) – 2 points

A. What distinguishing characteristic would a Cz horizon have? (1 pt.)

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B. A Bk horizon would contain _____ . (1 pt.)

Answers:

A. Frozen

B. Carbonates

Source: Manitoba Soil Sustainability in the 21st Century

Wildlife (20) – 2 points

Name two (2) specific positive values that beaver provide to people (i.e., why they would be beneficial). (1 pt. each)

Answer: Any 2 of the following

- *Commercial value of the pelt*
- *Commercial value of the castors*
- *Recreational or wildlife viewing value*
- *Cultural or religious or social value*
- *Biological value eg. create wetlands*
- *Scientific value*
- *Ecosystem value*

Source: April Workshop and page 17 and 109 of Wildlife Binder

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STOP 21**Aquatics (21) – 10 points****EQUIPMENT PROVIDED**

10

A. Using the equipment provided at this stop (survey level and rod), determine the width of the river. Please note a near bank location has been identified for the rod person to place the rod on. Once you have recorded the measurements from the near bank rod, take the bank rod readings. The difference in each of the near bank and far bank readings need to be multiplied by 100 prior to determining the width. (4 pts.)

The river width is _____ m.

B. The shape of a channel is the function of what three (3) things? (1.5 pts. – 0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____

C. There are a number of flow regimes - the timing, amount and frequency of flows – within a river that occur within a year or over the course of a number of years. Circle which is considered the most important flow as it shapes the physical characteristics of the river channel including riffles and pools; determines size of stream bed substrates; prevents riparian vegetation from encroaching into channel; restores normal water quality conditions after prolonged low flows; aerate eggs in spawning grounds and prevents siltation? (0.5 pt.)

- a) mean annual flow
- b) low flow
- c) flood flow
- d) bankfull flow

D. Fill in the blanks. (1 pt. – 0.5 pt. each)

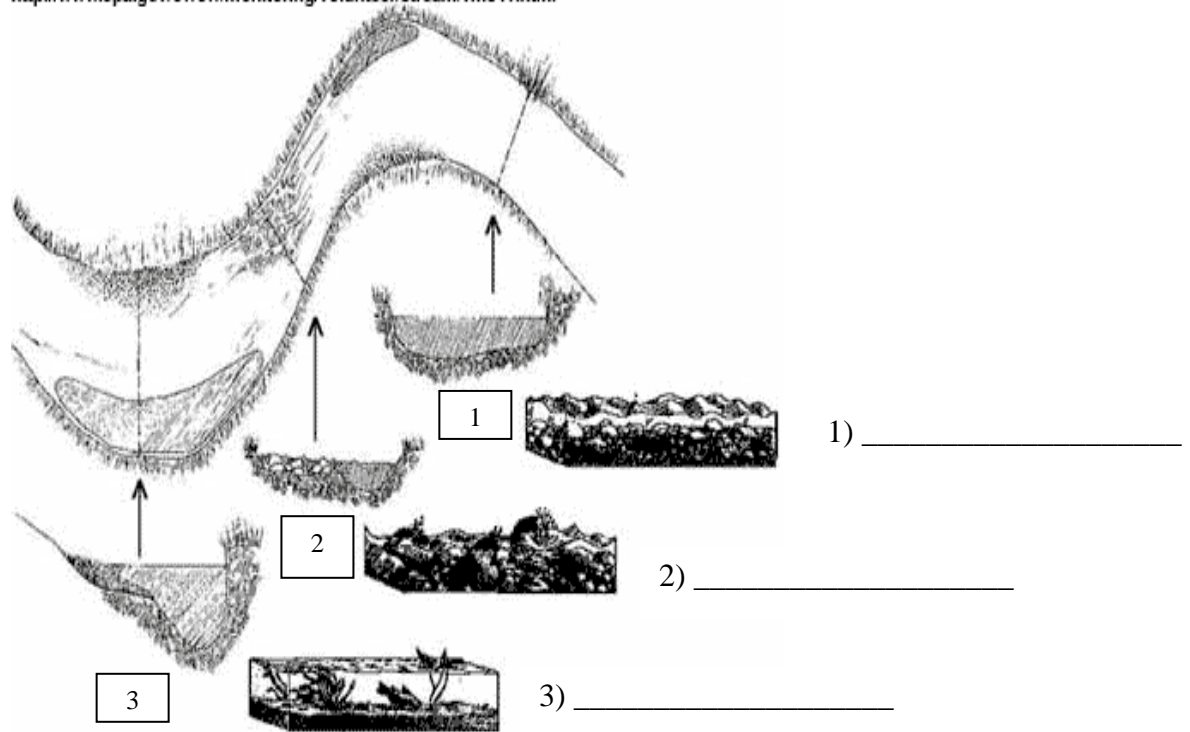
The deposition of sediment on the opposite bank is known as the _____ . The progressive growth of this depositional area forms a flat surface or _____ .

E. Looking at the aerial photo provided at this stop, name the feature identified. (0.5 pt.)

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F. Label the areas referred to in the following diagram. (1.5 pts. – 0.5 pt. each)

<http://www.epa.gov/owow/monitoring/volunteer/stream/vms41.html>



G. You are a contractor that needs to do some instream work in the Assiniboine River. Department of Fisheries and Oceans uses In Water Construction Timing Windows as one of many mitigation measures required to protect fish and fish habitat when working in or around water. The timing window for spring spawning fish in southern Manitoba is April 1st – June 15th. During this time no in-water or shoreline work is allowed except under site – or project specific review and with the implementation of protective measures.

The following fish species are present in the area you are proposing to work. Circle the fish species that are spring spawners. (1 pt.)

- | | | |
|-----------------|---------------|-----------------|
| brown bullhead | goldeye | freshwater drum |
| channel catfish | yellow perch | northern pike |
| walleye | white suckers | lake sturgeon |

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Answers:

A. **TBD at trail site**

B. *flow; quantity and characteristics of sediment in motion and characteristics/composition of the material that makes up the bed and banks of the channel*

C. *d*

D. *point bar and flood plain*

E. *oxbow lake*

F. 1. *pool*
 2. *riffle*
 3. *run*

G. *walleye, yellow perch, white suckers and northern pike*

Source: April Workshop

Alternative or Renewable Energy (21) – 2 points

A. What country is identified as a leader in Hydrogen Fuel Cell Technology? Circle the correct answer. (1 pt.)

U.S.

Germany

Sweden

Canada

B. What is the waste product from the hydrogen fuel cell? (1 pt.) _____

Answer:

A. *Canada*

B. *water*

Source: Manitoba Envirothon 2007 Theme Guide p. 36

Forestry (21) – 2 points

If you were going to start working on a long-term study at this site to collect information to monitor the potential effects of climate change on the forest, what are four (4) examples of information would you need to collect for this study site? (0.5 pt. ea)

1) _____

2) _____

3) _____

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4) _____

Answers:**Baseline Data Collection:**

>Vegetation Data

- Tree and Shrub Layer
- Age and Height of Dominant Trees
- Herb Layer

>Wildlife

- Small Mammal Abundance and Species Composition
- Other Signs of Wildlife

>Supporting Environmental Information

- Current Weather
- Air Temperature
- Relative Humidity
- Soil Temperature
- Soil pH
- Light Intensity and Crown Closure

Source: High school forestry study with Black River First Nation students <http://www.modelforest.net/cmfn/en/>

Soils (21) – 2 points

A. Define **moraine** (1 pt.): _____

B. Circle the appropriate word in the following sentence:

Bulk density tends to be (**higher**) / (**lower**) in sandy soils than in clays. (1 pt.)

Answers:

A. A blanket or ridge of unsorted debris left by a glacier.

B. higher

Source: Glossary, Page 59-60

Soil Management Guide, p.10

Wildlife (21) – 2 points

EQUIPMENT PROVIDED

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A. Name the general habitat (as opposed to a biome or ecoregion) in which this furbearing animal (provided at the stop) exists. (1 pt.)

B. Give one (1) reason for your answer above. (1 pt.)

Answers:

A. Any of the following or similar

- *Aquatic*
- *Water*
- *Rivers*
- *Wetlands*
- *Marsh*

B. Anything related to adapted for swimming in aquatic habitats, including:

- *Body is streamlined*
- *Fur is short*
- *Fur grows in one direction,*
- *Fur is water repellent*
- *Webbed feet for swimming*
- *Dark pelage for camouflage*

Source: April Workshop

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STOP 22**Aquatics (22) – 10 points****EQUIPMENT PROVIDED**

10

Refer to the satellite photo (provided) of the Assiniboine valley where we are now located. Note the flow pattern of the Assiniboine River. Answer the following questions.

A. What do we call the many large bends in the river? (1 pt.) _____

B. What do these bends indicate about the river's flow at this location? (1 pt.)

C. Would you expect the faster flows to occur at the outside or the inside of each bend? (1 pt.)

D. How would the banks differ on the outside and inside of these bends? (2 pts.)

Note the weir (marked in photo) stretching across the river downstream from our location.

E. What purpose does this weir serve? (1 pt.)

F. Why would this weir not be particularly suitable for generating hydro electricity? (1 pt.)

G. What kind of dam would be needed to generate electricity effectively at this location? (1 pt.)

H. List two (2) undesirable impacts that such a dam would create. (2 pts. – 1 pt. each)

1) _____

2) _____

Answers:

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- A. meanders*
- B. slow moving*
- C. outside of bends*
- D. Cut or eroding bank on outside; Depositional bank on inside*
- E. maintains a minimum water level at low flows*
- F. insufficient head or drop; insufficient flow in low water periods*
- G. high dam spanning the whole valley floor*
- H. flood valuable land; block fish passage; result in more methyl mercury in fish)*

Sources:

Training session at St. Leon

CD/Binder A18. "Sustaining Aquatic Ecosystems in Boreal Regions"; A14. "Managing the Water's Edge"

Miscellaneous readings/observations

Alternative or Renewable Energy (22) – 2 points

List four (4) emission benefits of bio-diesel over petroleum diesel. (0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answers: 70% reduction in GHG's, Over 70% reduction in particulates, Carbon monoxide reduced by 50%, Sulfur reduced by 100%

Source: Presentation at April Workshop

Forestry (22) – 2 points

A. What has the general length of fire cycles in Manitoba been since the last ice age? (1pt.)

B. What is the most fire dependent tree species in Manitoba? (1 pt.)

Answer:

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A. Forest stands in Manitoba have been subject to firekill every 75 to 125 years since the last ice age.

B. Jack pine is the most fire dependent species in the province.

Source: MFA: FOREST RESOURCE MANAGEMENT IN MANITOBA - HOWS AND WHYS, 1. Clearcutting in Manitoba (p. 8)

Soils (22) – 2 points

A. What particle size is produced as a result of the weathering of granite? (1 pt.)

B. What particle size is produced as a result of the weathering of shale? (1 pt.)

Answers:

A. sand

B. clay

Source: Spring Workshop 2007

Wildlife (22) – 2 points

EQUIPMENT PROVIDED

A. Name three (3) adaptations or features that a polar bear has which helps it obtain its most important food source. (1.5 pts. – 0.5 pt. each)

1) _____

2) _____

3) _____

B. Name the polar bear's most important food source. (0.5 pt.)

Answers:

A. Any of the following

- *Large feet (for walking on ice or swimming in water)*

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- *White coat (for camouflage and reflect sunlight in the hot summer)*
- *Thick well-insulated coat or thick layer of fat to insulate against cold while on ice*
- *Hair on feet (for grip on ice)*
- *Good sense of smell*
- *Large nasal cavity (for good sense of smell)*

B. Seals or seal fat

Source: April Workshop and page 29

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STOP 23**Aquatics (23) – 2 points****EQUIPMENT PROVIDED**

Using the labelled images provided at this stop, write down the letters in the correct order to create a food chain, starting from the bottom of the chain.

_____ → _____ → _____ → _____

Answer: C, B, D, A (phytoplankton → zooplankton → minnow → crayfish)

Source: Aquatic binder

Alternative or Renewable Energy (23) – 10 points

10 A. Describe **passive** and **active** solar energy. (2 pts. – 1pt. each)

Passive solar energy: _____

Active solar energy: _____

B. What are the three (3) main types of uses for solar energy? (3 pts. – 1 pt. each)

1) _____

2) _____

3) _____

C. Describe how wind generation is considered a form of solar power. (2 pts.)

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D. List three (3) beneficial aspects of solar energy and three (3) concerns about solar energy. (3 pts. – 0.5 pt. each)

Benefits	Concerns

Answers:

A. *Passive solar energy* uses solar radiation directly (greenhouse windows or dark coloured batch collecting tanks). **Active solar energy** involves collecting solar radiation and transforming it into useable energy (solar energy heats water then pumps it into a house to heat)

Source: Envirothon 2007 Theme Guide p. 31

B. *Space heating, Water heating and smaller scale electricity generation*

Source: Envirothon 2007 Theme Guide p. 31

C. *Sunlight warms the air, causing it to rise. This creates surface winds over land and water.*

Source: Envirothon 2007 Theme Guide p. 31

D. *Solar energy is inexhaustible and has minimal operating costs. It can be a stand-alone technology suitable for remote and/or off-grid locations. It does not emit greenhouse gases or air pollutants and even displaces some GHG emissions. However, solar energy relies on daylight and small scales of energy production. Start up costs are more expensive and power must be converted from DC to AC to work with other sources of energy.*

Source: Envirothon 2007 Theme Guide p.42

Forestry (23) – 2 points

In your own words define the term employment multiplier as it pertains to the forest industry. (2 pts.)

Answer: A value that when multiplied by the direct employment of a given industry indicates the total direct and indirect employment generated by that industry.

Source: Manitoba’s Forests pg 8.

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Soils (23) – 2 points

EQUIPMENT PROVIDED

Examine soil sample A and B.

Which would you postulate has the greatest OM levels? (1 pt.) _____

Why? (1 pt.) _____

Answer: *TBD at trail test*

Source: Spring Workshop 2007

Wildlife (23) – 2 points

Circle the correct responses. (1 pt. each)

A. What percentage of Tall Grass Prairie is remaining in North America?

- a) greater than 30%
- b) 12%
- c) less than 0.5%

B. What percentage of Mixed Grass Prairie is remaining in North America?

- a) 55%
- b) 41%
- c) less than 20%

Answers:

A. c. Less than 0.5%

B. c. Less than 20%

Source: Mixed Grass Prairie Brochure

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STOP 24**Aquatics (24) – 2 points**

For the following sources of fresh water on Earth, number them in order of relative abundance with 1 being the most abundant and 4 being the least abundant. (0.5 pt. each)

- _____ Ice Caps, Glaciers and Snow
- _____ Ground Water (aquifers and other underground sources)
- _____ Atmosphere (clouds and vapour)
- _____ Surface water (lakes, rivers, streams, ponds)

Answer: 1, 2, 4, 3

Source: CD/Binder A1. "Water as Environment"

Alternative or Renewable Energy (24) – 2 points

What are some of the remote power uses (where electrical power is not generally available) of solar energy? List at least four (4). (0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answers: Telecommunications, irrigation, vehicle propulsion, hand held electronic devices such as calculators, heating water and pools

Source: Manitoba Envirothon 2007 Theme Guide p. 31

Forestry (24) – 10 points

A. True or False. Circle the correct response. Approximately twice as many softwood trees become established on renewed area as were harvested from those areas. (1 pt.)

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True**False**

B. Place beside each native species its importance in terms of volume harvested by the Forest industry in Manitoba. (2 pts. – 0.5 pt. each)

<u>Species</u>	<u>Rank</u>
Black Spruce	_____
Jack Pine	_____
Trembling Aspen	_____
White Spruce	_____

C. Circle the best response. What percentage of Manitoba's Annual Allowable Cut was harvested in 1991? (1 pt.)

- a) 20%
- b) 40%
- c) 60%
- d) 80%

D. True or False. Circle the correct response. While harvesting using a clearcutting system it is possible to ensure conservation of wildlife habitat, natural beauty and other uses such as recreation. (1 pt.)

True**False**

E. Circle the best response. Approximately how many trees are planted annually in Canada? (1 pt.)

- a) 100 million
- b) 300 million
- c) 600 million
- d) 900 million

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F. Define **Annual Allowable Cut** (AAC). What can it be compared to? (4 pts. – 2 pts. each)

Answers:

A. *T*

B. *ta=1, bs=2, jp=3, ws=4*

C. *a*

D. *T*

E. *c*

F. *The amount of timber that can be harvested from a specified forest area on a sustainable basis. It can be compared to the interest earned on money in a bank account.*

Sources: A) workshop, B)and C) Manitoba's Forests, D) Clearcutting E), Certification F) workshop

Soils (24) – 2 points

EQUIPMENT PROVIDED

Using the Canada Land Inventory map 'Soil Capability for Agriculture' locate the E½ 16-5-1W. Answer the questions below. (1 pt. each)

A. What is the class? _____

B. What is the subclass? _____

Answer:

A. *3*

B. *subclass W*

Source: Spring Workshop 2007

Wildlife (24) – 2 points

Give an example of one (1) bird and one (1) plant listed on the Federal Species at Risk listing for the Mixed Grass Prairie Region of Manitoba. (1 pt. each)

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Bird: _____

Plant: _____

Answers:**Bird:** *Ferruginous hawk, Loggerhead shrike, Sprague's pipit, Baird's sparrow
Burrowing owl***Plant:** *Hairy prairie clover, Small white lady's-slipper, Smooth goosefoot, Western
spiderwort***Source:** Mixed Grass Prairie Brochure

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STOP 25**Aquatics (25) – 2 points**

Circle the fish species that are listed at risk in Manitoba.

lake whitefish	bigmouth buffalo
arctic char	mooneye
chestnut lamprey	lake sturgeon
silver chub	common carp
yellow perch	rosyface shiner

Answers: bigmouth buffalo, chestnut lamprey, silver chub, rosyface shiner

Source: “Fish Species at Risk in Manitoba”

Alternative or Renewable Energy (25) – 2 points

Define **carbon neutral** and **carbon sequestration** (1 pt. each)

Carbon neutral: _____

Carbon sequestration: _____

*Answers: **Carbon Neutral** – a process wherein the amount of CO₂ emissions produced during energy use is equal to the amount absorbed during energy production.*

***Carbon Sequestration** – the absorption of carbon emissions through biological or technological processes.*

Source: Manitoba Envirothon 2007 Theme Guide p. 50

Forestry (25) – 2 points

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In general, these deciduous trees around you contribute more to carbon storage than a deciduous tree on a city yard. Why?

Answer:

In the urban environment, it is assumed that the annual litter fall from the tree is removed, so no carbon is added to the soil. In rural and afforestation areas, however, litter is not removed, so we assume a typical added component of carbon stored in the soil. Overall, our calculations suggest that the “average” Canadian tree will sequester about 200 kg C over an 80-year period in an urban environment, and 225 kg C in a rural environment. On an annual basis, this is equivalent to storage of 2.5 kg C yr⁻¹ in an urban environment, and 2.8 kg C yr⁻¹ in a rural one.

Source: Envirothon CD: What Trees can do to reduce atmospheric CO₂

Soils (25) – 2 points

A. Columnar structures develop in soils with significant amounts of _____ present in the subsoil. (1 pt.)

B. Rust-coloured spots in the subsoil formed by alternating wetting and drying conditions is referred to as _____. (1 pt.)

Answers:

A. sodium

B. mottles

Source: Spring Workshop 2007

Wildlife (25) – 10 points

EQUIPMENT REQUIRED

A. Describe how the native Mixed Grass Prairie benefits the following; (4 pts. – 1 pt. each)

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1) Wildlife: _____

2) The Environment: _____

3) The Economy: _____

4) People and Communities: _____

B. Select four (4) pictures that represent a benefit to a Mixed Grass Prairie. (1 pt.)

_____ # _____ # _____ # _____

C. Select four (4) pictures that represent a detriment to the Mixed Grass Prairie. (1 pt.)

_____ # _____ # _____ # _____

D. List two (2) physical adaptations the plant shown in picture A has for survival in the Mixed Grass Prairie. (2 pts. – 1 pt. each)

1) _____

2) _____

E. i) List one (1) physical adaptation the Burrowing Owl has to survive in the Mixed Grass Prairie. (1 pt.)

ii) List one (1) behavioural adaptation this bird has for survival. (1 pt.)

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Answers:

- A.**
- 1) Wildlife** – by providing critical habitat. Many species will not live in a modified habitat such as tame grass or cropland.
 - 2) The environment** – by improving water and soil quality for plants and other living organisms, reducing erosion and runoff, and storing carbon.
 - 3) The economy** – it has sustained generations of ranchers by providing forage for our grazing livestock.
 - 4) People and communities** – by providing recreation, economic and research opportunities. As well, it is tied to Manitoba's rich Aboriginal and cultural heritage, and contributes to the exceptional quality of life that many rural communities enjoy.
- B.**
- # 1 – Flea Beetle
 - # 2 – Fire,
 - # 5 – Cattle,
 - # 8 – People
- C.**
- # 3 – Plow,
 - # 4 – Trembling Aspen,
 - # 6 – Leafy Spurge,
 - # 7 – Homes,
- D. Any 2 of the following**
- Attractive and fragrant flowers to attract insects such as butterflies and bees to aid in pollination
 - Seed dispersion by wind
 - Waxy stem to reduce evaporation
 - Milky-white toxic sap that keeps animals from grazing on the plant. (Monarch Butterflies have evolved to feed on them to ward off predators.)
- E.**
- i) Small size, camouflage, eats insects, large eyes, ground nester
 - ii) Goes under ground when faced with danger, migrates south for the winter

Source: Mixed Grass Prairie Brochure

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STOP 26**Aquatics (26) – 2 points**

List one (1) example of point source pollution and non-point source pollution **visible at this site.** (1 pt. each)

Point source: _____

Non-point source: _____

Answers:

Point source: storm water drain

Non-point source: field cultivated to edge (across and to south of this stop)

Source: Nonpoint Source Pollution: The Nation's Largest Water Quality Problem

Alternative or Renewable Energy (26) – 10 points

10

A. What is the main reason that we seek to develop renewable energy alternatives? (2 pts.)

B. Which alternative/renewable energy is expected to have a positive impact on the soil and why? (1 pt.)

C. Describe the impact of each of the following energy sources on aquatic systems.
(3 pts. – 0.5 pt. each)

Solar energy: _____

Wind energy: _____

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Tidal and Wave energy: _____

Hydro energy: _____

Geothermal energy: _____

Biomass energy: _____

D. Provide four (4) examples of energy that may be detrimental to wildlife and describe how. (2 pts. – 0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

E. Biomass energy has been described as having excellent potentials to reduce GHG emissions, but to fully benefit, what forest management practices are required? List four (4) examples. (2 pts. – 0.5 pt. each)

- 1) _____
- 2) _____
- 3) _____
- 4) _____

Answers:

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A. The main reason for renewable energy alternatives is the impact of conventional energy on the environment often exceeds our ability to live with its wastes and emissions.

Source: Manitoba Envirothon 2007 Theme guide p.45

B. Biomass energy may have a positive influence on soil quality because agricultural energy crops (trees, grasses, grains, etc.) establish root systems that help to build up topsoil and retain nutrients in the ground.

Source: Manitoba Envirothon 2007 Theme Guide p. 46

*C. **Solar energy** – no impact, other than possible impacts in construction*

***Wind energy** – no impact, other than possible impacts in construction*

***Tidal and Wave energy** – change natural aquatic ecosystems through sediment disruption, increased pollution levels, and/or altering the physical properties of the aquatic system*

***Hydro energy** – alter river continuity and cause increased water siltation by reducing water flow*

***Geothermal energy** – closed systems, little impact, but leakage can occur. Open-loop systems alter local water temperatures with the effluent water.*

***Biomass energy** – can require substantial water supply, additional crops reduce risk of erosion and can filter impurities, making the water systems cleaner.*

Source: Manitoba Envirothon 2007 Theme Guide p. 47

*D. **Fossil fuels** – Land , air & water pollution*

Hydroelectric dams – Habitat loss

Wind Turbines – impact flyways

Planting Energy crops – transform natural landscapes

Source: Manitoba Envirothon 2007 Theme Guide p. 48

E. Planting new forests, cultivating non-traditional plant species, increasing forest crop diversity, ensuring longer harvest periods and strategic logging methods would be beneficial to increasing the effectiveness of biofuel energy in reducing current and future GHG emissions.

Source: Manitoba Envirothon 2007 Theme Guide p. 48

Forestry (26) – 2 points

A. Name Manitoba's provincial tree? (1 pt.)

B. Ecosystem Based Management (EBM) is: (1 pt.)

Answers:

A. *White Spruce*

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B. the process of developing management principles and implementing actions that will preserve and ensure its stability and sustainability. It takes into account the relationships between artificial and natural environments and people.

Source: A) Manitoba's Forests, B) Next Steps

Soils (26) – 2 points

A. When soil surveyors add a dilute HCl solution to soils they are checking for the presence of _____ . (1 pt.)

B. The reaction seen is the evolution of _____ . (1 pt.)

Answers:

A. carbonates

B. carbon dioxide

Source: Spring Workshop 2007

Wildlife (26) – 2 points

List two (2) reasons why the Mixed Grass Prairie is being replaced by Trembling Aspen and other shrubs. (1 pt. each)

1) _____

2) _____

Answer:

1. Lack of Fires – fire suppression

2. Intensive Grazing of cattle

Source: Mixed Grass Prairie Brochure

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STOP 27**Aquatics (27) – 10 points**

EQUIPMENT PROVIDED

10

A. Using the pictures provided at the stop, write the name of the aquatic invasive species next to the appropriate letter. A word bank has been provided to assist you. (2 pts. – 0.5 pt. each)

a) _____

b) _____

c) _____

d) _____

bighead carp
rufferainbow smelt
spiny waterfleacommon carp
rusty crayfishwhite bass
round gobi

B. Look at the list of species below. Circle the aquatic invasive species that are currently present in Manitoba. (1 pt.)

common carp

rusty crayfish

paddlefish

rainbow smelt

zebra mussels

white bass

spiny waterflea

round gobi

C. List at least three (3) problems caused by aquatic invasive species. (3 pts. – 1 pt. each)

1) _____

2) _____

3) _____

D. List at least three (3) ways that you can prevent the spread of aquatic invasive species. (3 pts. – 1 pt. each)

1) _____

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2) _____

3) _____

- E. i) Look at the two pictures marked E and F. Which of these is a rusty crayfish? Circle the correct response. (0.5 pt.)

E**F**

- ii) What regulation did Manitoba put into effect due to the threat of this species entering our waters? (0.5 pt.)

Answers:

A. *a = white bass b = rainbow smelt c = spiny waterflea d = round gobi*

B. *common carp, rainbow smelt, white bass*

C. Any 3 of the following

- *reduce the variety of aquatic life in Manitoba waters*
- *require costly control measures*
- *cause damage to Manitoba ecosystems (e.g. interrupt food web, prey on other native species, etc.)*
- *reduce the social economic value of lakes and rivers*

D. Any 3 of the following

- *Remove visible mud, plants and organisms from equipment before transporting.*
- *Drain all water from boats, including bilge water, bait buckets, and live wells before transporting.*
- *Wash boat and equipment or dry in the sun for at least five days.*
- *Never release live bait fish in lakes or rivers. Dispose of unwanted bait away from surface water.*
- *Never release or flush aquarium fish.*

- E.** i) *e*
ii) *zero possession limit on ALL crayfish*

Source: April Workshop

Alternative or Renewable Energy (27) – 2 points

It has been suggested that the type and size of a particular energy source will also have differential effects depending upon the environment in which it is located. Please explain as it relates to using this river for power generation.

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Answer: *A large scale hydro project that floods this valley would be far more damaging than would “run of the river” hydropower facilities.*

Source: Manitoba Envirothon 2007 Theme Guide

Forestry (27) – 2 points

Circle the correct responses. (1 pt. each)

A. What percentage of Manitoba’s harvested lands receive silvicultural treatments?

- a) 25 %
- b) 50 %
- c) 75 %

B. True or False. All Forestry companies operating on public land have the option to seek public input on their long-term forest management plans?

True

False

Answers:

A. c) 75%

B. F

Source: A) Mb’s Forests, B) Binder CFL, page 20

Soils (27) – 2 points

Agriculture capability is a seven class rating of mineral soils based on the severity of limitations for dryland farming.

A. Which class of soils has no limitations for annual crop production? (1 pt.) _____

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B. Which class of soils have such severe limitations that they are not suitable for agricultural purposes? (1 pt.) _____

Answers:

A. 1

B. 7

Source: Soil Management Guide, Pages 27 and 28

Wildlife (27) – 2 points

A. Manitoba's Mixed Grass Prairie is found within what region of our province? Circle the correct response. (1 pt.)

- a) south west
- b) south east
- c) central
- d) all of the above

B. Circle the appropriate words in the following sentence: (1 pt. – 0.5 pt. each)

Mixed Grass Prairie generally contains a mix of the shorter grass species that prefer the more arid conditions found further **(east)** / **(west)** in the Prairies and the Tall Grass Prairie species found further **(east)** / **(west)**.

Answers:

A. (a) south west Manitoba

B. west, east

Source: Mixed Grass Prairie Brochure

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STOP 28**Aquatics (28) – 2 points****EQUIPMENT PROVIDED**

Use the “Photo Field Guide to the Freshwater Mussels of Ontario” to identify the mussels found at this stop. ****Note: Manitoba species have been flagged.* (1 pt. each)

a) _____

b) _____

Answers:

A. pink heelsplitter

B. fat mucket

Source: Field training and guide provided

Alternative or Renewable Energy (28) – 2 points

Explain why ethanol can not be shipped in the same equipment as gasoline?

Answer: *the ethanol reacts with the moisture in the equipment.*

Source: Presentation at April Workshop

Forestry (28) – 10 points

What are five (5) different values of the forest? List an example of each. (2 pts. each)

1) _____

2) _____

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- 3) _____

- 4) _____

- 5) _____

Answers: For each of the five categories listed, can list one of the following examples:

1. **Ecological** – habitat for wildlife, creates oxygen, moderates climate, stores water and slows runoff, carbon stores, absorbs GHGs
2. **Economic** – main industry in Canada, provides many jobs, supports other natural resource industries such as trapping, fishing, etc.
3. **Wood products** – pulp used to make paper, firewood, food items (mushrooms, berries, nuts, maple syrup), wood by-products such as rayon, adhesives, etc.), Christmas trees
4. **Cultural and Spiritual** – inspiration for artists, poets, spiritual for for Aboriginal people, link to our history
5. **Recreational** – hiking, camping, bird watching, fishing, hunting, ecotourism.

Source: Sustainable Forest Ecosystems – A Senior 2 Science Unit. Chapter One, Introduction to Forest Ecology, Section 1.2 Forest Values – *Plus others*

Soils (28) – 2 points

- A. Luvisols are typically found under _____ vegetation. (1 pt.)
- B. Chernozems are typically found under _____ vegetation. (1 pt.)

Answers:

- A. Forested**
B. Grassland

Source: Spring Workshop 2007

Wildlife (28) – 2 points

Circle the correct responses. (1 pt. each)

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A. Migration, dormancy and toughing it out are three (3) main strategies animals use for:

- a) reproduction
- b) surviving cold winters
- c) finding food
- d) avoiding predation

B. In Canada, migratory bird conservation is managed co-operatively by federal and provincial governments under what authority?

- a) Canada Migratory Bird Convention Act
- b) Mississippi Flyway Convention Act
- c) Constitutional Bird Act
- d) Federal-Provincial Wildlife Conservation Act

Answers:

A. (b)

B. (a)

Source: Animal Adaptations, page 32
Wildlife Conservation and Management, page 7

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STOP 29**Aquatics (29) – 2 points****EQUIPMENT PROVIDED**

A. For each of the two items on display, indicate its purpose. (1 pt. – 0.5 pt. each)

a) _____

b) _____

B. Why is it important to know the information provided by item (a)? (0.5 pt.)

C. What can be done with the sample taken with item (b)? (0.5 pt.)

Answers:

*A.(a) Secchi Disk – to measure the **penetration of light** into the water column; (b) Ekman Dredge – to take **samples of soft bottom sediment***

B. It provides an estimate of the depth to which photosynthesis can occur

C. The sediment can be sieved or sorted to find and identify animals living in it

Source: Display and demonstrations during training at St. Leon

Alternative or Renewable Energy (29) – 2 points

Provide two (2) examples of biomass energy that may be beneficial to wildlife and a brief explanation of how. (1 pt. each)

Example	How it is beneficial

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Answer: Energy crops can be more beneficial habitat to wildlife, Improve aquatic habitats by filtering runoff

Source: Manitoba Envirothon 2007 Theme Guide

Forestry (29) – 2 points

If trees were planted in lines along the border of this field, what form of Agroforestry is being demonstrated? (1 pt.) _____

Why would this be done along a field edge? (1 pt.) _____

Answer:

Windbreaks – planting of trees/shrubs to manage the effect of wind on erosion and soil moisture in addition to other benefits

Source : <http://web.extension.uiuc.edu/forestry/agroforestry.html>

Soils (29) – 10 points

EQUIPMENT PROVIDED

Using the Canadian System of Soil Classification (CSSC) provided, key out the soil to the subgroup level. (Hint: Not a Podzol).

A. Soil Order (2 pts.)

B. Great Group (2 pts.)

C. Subgroup (2 pts.)

D. What is the depth of the B horizon? (1 pt.)

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E. What is the colour of the A horizon? (1 pt.)

F. Using Table 8 in the CSSC what would this soil be classified as using the U.S. system? (2 pts.)

Answer: **TBD at trail test**

Source: Spring Workshop 2007 and CSSC

Wildlife (29) – 2 points

A. _____ is the orderly replacement of one biotic community with another. (1 pt.)

B. Each level of consumption in the food chain is called _____.
(1 pt.)

Answers:

A. Succession

B. trophic level

Sources : Habitat, page 14
Food Chains, page 26

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STOP 30**Aquatics (30) – 2 points****EQUIPMENT PROVIDED**

Using the key and species provided at the stop, identify each aquatic invertebrate by writing its common name beside the appropriate letter. (0.5 pt. each)

- a) _____ b) _____
 c) _____ d) _____

Answers: *a = water mite* *b = scud*
 c = caddisfly larva *d = mayfly larva*

Source: Aquatics binder

Alternative or Renewable Energy (30) – 2 points

Circle the best responses. (1 pt. each)

A. How many million litres of diesel fuel is used in Manitoba annually?

100-200 300-400 800-900 1000-1100

B. How many million litres of diesel fuel is used by agriculture in Manitoba annually?

30-40 100-200 201-300 301-400 401-500

Answers:

A. 850

B. 350

Source: Presentation at April Workshop

Forestry (30) – 2 points

A. What is the difference between an alien forest species and a forest pest? (1 pt.)

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B. Give one (1) example of each currently present in Manitoba. (1 pt. – 0.5 pt. each)

Alien forest species: _____

Forest pest: _____

Answer:

A. *An alien forest species is any species, subspecies or race occurring in an area or ecosystem to which it is not native.*

A forest pest is when an alien species causes significant changes in an ecosystem, displacing native organisms by predation or parasitism, by competition for space and food or by altering of habitat, when these impacts are high resulting in environmental damage, economic and social losses.

B. *Species List to be determined*

Source: Alien Pest, workshop

Soils (30) – 10 points

10

A. Match the correct term to the definitions. (5 pts. – 1 pt. each)

- | | |
|---------------------------------|----------------------------|
| a. gravimetric moisture content | f. bulk density |
| b. plastic limit | g. texture |
| c. infiltration | h. soil series |
| d. hydraulic conductivity | i. root channel saturation |
| e. soil porosity | |

_____ Measurement made by determining the oven-dry mass of soil per unit volume: expressed as g/cubic cm.

_____ $[(\text{weight of wet soil} - \text{weight of dry soil}) \times 100] / \text{weight of dry soil}$

_____ Entry of water into the soil

_____ Rate at which water can pass through a soil, usually under saturated conditions.

_____ Percentage of a given volume of soil that is made up of air spaces.

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B. Match the following deposition terms to the correct definitions below. (5 pts. – 1 pt. each)

- | | |
|--|---------------------|
| _____ Lake deposited, usually well sorted | a. till |
| _____ Wind deposited | b. lacustrine |
| _____ Glacier deposited material | c. outwash |
| _____ Accumulation of dead vegetation
in poorly drained areas | d. fluvial |
| _____ River or stream deposited | e. eolian |
| | f. organic deposits |

Answers:

A. *f, a, c, d, e*

B. *b, e, a, f, d*

Source: Water Use and Moisture Management

<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s04.html>

Source: Understanding the Soil Landscapes in Manitoba

<http://www.gov.mb.ca/agriculture/soilwater/soil/fbe01s02.html>

Wildlife (30) – 2 points

A. What is the single greatest threat to wildlife? Circle the correct response. (1 pt.)

- a) hunting
- b) diseases
- c) loss or degradation of habitat
- d) feeding of wildlife

B. If a predator manages to bite off the salamander's tail or limb, what amazing thing will happen? (1 pt.)

Answers:

A. *(c)*

B. *it or both will grow back*

Source: Ecology and Wildlife Management, page 21; April Workshop