

ASSINIBOINE TRAIL

Stop 1:

Aquatics – 4 Points

EQUIPMENT REQUIRED

You are provided photographs, taken over the last two months, of the development activities north of Kirkcaldy Drive (formerly Manitoba Avenue). These activities include the building of a Home Depot store and several residential streets.

The Canada-Manitoba Flood Damage reduction program became effective in Brandon in 1982. You are also provided a copy of the Flood Risk Map for the Brandon Area with the development activities area indicated with a red box. Review this information and then answer the following questions.

- A) Are these developments in the “floodway fringe” or the “floodway” portion of the flood risk area for the Assiniboine River? (2 points)

- B) List two (2) impacts that these developments will likely have on the water resources in the Assiniboine River. (1 point each).

Answer:

A) *Partially in the Floodway Fringe. Provided map.*

B) *Reduced baseflow, increased runoff volume, increased runoff temperature, decreased runoff quality, increased nutrients and contaminants.*

Source: A-2, pp. 78 to 86.

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Urban Ecology - 2 Points

- A) Conventional sewage treatment normally involves:
- A. Primary treatment
 - B. Secondary treatment, and
 - C. Tertiary treatment.

Which of the treatments shown above employs biological processes in which bacteria and other microorganisms degrade most of the dissolved organic matter, as well as 30% of phosphates and about 50% of nitrates? (1 point)

- B) Which of these treatments is designed to remove pollutants, such as non-biodegradable organic material, and inorganic compounds which promoted eutrophication? (1 point)
-

Answer:

A) *Secondary treatment (B)*

B) *Tertiary Treatment (C)*

Source: p. 504 Urban Ecology binder

Forestry - 2 Points

Silviculture is:

Answer: The art and science of growing trees or cultivating a forest

Source: Silviculture in Manitoba, Manitoba Conservation website

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Soils - 10 Points

EQUIPMENT REQUIRED

Two clear columns of soils with different texture are placed in a bucket of water. The two columns (A & B) provided have different soils.

- A) Why do they have different heights to where wetting has occurred? (2 points)

- B) How has the water reached this height? (1 point)

- C) What soil would have a higher water holding capacity? Why? (2 points)

- D) In the table below place an 'X' in the texture that best fits into the situation described. (0.5 points each)

Situation	Clayey	Sandy
Higher risk for nutrient leaching		
Higher risk to soil compaction		
Greater water holding capacity		
Larger pore spaces		
Greater pore space volume		
Better for building lagoons		
Greater risk to surface water runoff		
Higher cation exchange capacity		
Better for growing potatoes		
Soils in the Red River Valley (Winnipeg)		

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Answers:

- A) Different soil texture. Water is held tighter and smaller pore space in the finer textured soil.
- B) Capillary action
- A) Smaller size of pore space, higher surface area of soil particles, water is bound tighter.
- B) See table below.

Situation	Clayey	Sandy
Higher risk for nutrient leaching		X
Higher risk to soil compaction	X	
Greater water holding capacity	X	
Larger pore spaces		X
Greater pore space volume	X	
Better for building lagoons	X	
Greater risk to surface water runoff	X	
Higher cation exchange capacity	X	
Better for growing potatoes		X
Soils in the Red River Valley (Winnipeg)	X	

Source: *Best Management Practices; Soil Management*

Wildlife - Climate Change - 2 Points

As the climate changes, Manitobans can expect massive changes in the range of various ecosystems. Over half the tundra may be replaced by boreal forest.

What species of bird may decline by approximately 7.5 million individuals as climate change alters the arctic?

Species of bird _____ (1 point)

Why? (1 point)

Answer: *Sandpipers.*
Approximately 14 million sandpipers raise young on the tundra – the arctic is their breeding ground.

Source: *Climate Change and Wildlife, Climate Change Connection*

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Stop 2:

Aquatics - 2 Points

True or false?

As water cools it increases in density until it reaches 4 degrees Centigrade (4°C) when it begins to decrease in density until freezing at 0 degrees Centigrade (0°C). Good thing - otherwise lakes would freeze solid beginning from the bottom.

T F

Answer: *True*
Source: *A-2, Page 4.*

Urban Ecology – 10 Points

- A) Looking north and north-east one sees the sweep of the Assiniboine River. Adjacent land uses show several aspects of urbanization. List the urbanization features you see in this view. Give four aspects for one point each. (4 points)

- B) Why are the wooded lands east of the river lower than the land you are standing on? Circle the answer that **least** fits for one point. (1 point)
1. The river is actively eroding the outside curves of its banks faster than the inside curves.
 2. Eroded soil is deposited onto the curving flood plain where water flows at a lesser rate than elsewhere.
 3. The woodland prevents the soil from accumulating any appreciable amount.
 4. Not all the eroded soil ends up in the nearby deposition flood plain, but can also move further down river.
 5. Newer flood plain lands are rarely as high as the land from which the soils originated.

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C) Why do you think the low lying flood plain lands on the east side of the river are wooded and not developed for urban or agricultural use? Circle the answer that **least** fits for one point. (1 point)

1. The land is usually under some depth of water during each spring and anytime there is a major storm event.
2. The entire area would have to be sand bagged to a considerable height at great cost with no guarantee that there would be no breach of the sand bag barrier.
3. Woodland animals would constantly be a significant urban pest to anyone living in this area.
4. Frequent flooding makes productive agriculture difficult if not impossible.
5. Active annual flooding makes urban development economically impossible.
6. Through provincial water resources flood plain zoning, these lands are legislated to keep urban development off them.

D) According to the report found in the Urban Ecology binder “Strengthening Manitoba’s Capital Region General Principles and Policy Directions”, what is the definition of “sustainable development”? Give three significant aspects for one point each. (3 points)

E) In terms of sustainability of urban areas, circle the correct statement. (1 point)

1. The construction of hard surfaces should be maximized to reduce flooding risks.
2. Incorporating recycling materials into the built urban environment has few practical benefits over the long term.
3. Municipalities should design their recycling and composting programs at the household and community levels.
4. The provision of water supply and use of water for urban areas are generally recognized as non-sustainable activities.

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Answer:

- A) Answer should have four of the following ideas:
1. Road development (Kirkcaldy Drive) near top of riverbank requires rip-rap (concrete and rock) for erosion/slumping control. The rip-rap has been placed extensively along the base and slopes of the river bank.
 2. Storm water outfall (pipe) on the riverbank is visible.
 3. Expanding development with new construction in the valley flood plain and on the top valley slopes.
 4. Storm run off from the development on the top of the valley and on sloping areas will enter the river more quickly through hard surfaced channels.
 5. The park itself is a form of protection for the once rural lands of this area. However, the park has been developed with an infrastructure of roads, parking lots, trails, buildings, lighting, bridge, water and sewer facilities, etc for recreational use.
- B) The correct answer is 3. The woodland prevents the soil from accumulating any appreciable amount.
- C) The correct answer is 3. Woodland animals would constantly be a significant urban pest to anyone living in this area.
- D) The answer should have three of the following ideas:
1. Environmentally sound development which can be sustained in the long term.
 2. Protection of the environment from degradation in order to develop economically.
 3. Meeting the needs of today should not sacrifice the ability of future generations to meet their own needs.
 4. Decision makes must take into account the long term of their economic decisions.
- E) The correct answer is 3. Municipalities should design their recycling and composting programs at the household and community levels.

Source:

- A) Observation
B) Observation
C) Observation and general knowledge
D) p. 846, Urban Ecology Binder
E) p. 753 and p. 755, Urban Ecology Binder

Forestry - 2 Points

Name two (2) of the most significant introduced pests to North American forests. (1 point each)

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Answers: *Gypsy moth, dutch elm disease, white pine blister rust, European elm bark beetle, sawflyies, balsam wooly adelgid, chestnut blight.*

Source: *Alien Forest Pests, NRCan*

Soils - Climate Change - 2 Points

Dr. Katherine Buckley, from the Brandon Research Centre (Agriculture and Agri-Food Canada), is studying the use of composting manure to decrease greenhouse gas emissions. Composting seems to change nitrogen into a less volatile form, thereby decreasing nitrous oxide (N₂O) emissions.

While all greenhouse gases trap heat in the atmosphere, they do not do so with equal strength. As such, one molecule of nitrous oxide (N₂O) does not trap the same amount of heat as one molecule of carbon dioxide (CO₂). Mark with an 'X', before the correct answer, the relative heat-trapping ability of nitrous oxide (N₂O) compared to that of carbon dioxide (CO₂) from the list below.

_____ ½x _____ 2x _____ 60x _____ 320x _____ 1000x

Answer: *320x*

Source: *p. 2, Climate Change and Agriculture*

Wildlife - Climate Change - 2 Points

- A) Polar bears rely heavily on a predictable abundance of a specific marine mammal to provide energy and nourishment for survival throughout the year. When do their prey begin giving birth, starting the bears' hunting season (please indicate month)?

Month: _____ (1 point)

- B) What is the full common name of this important prey animal?

Full common name: _____ (1 point)

Answer:

C) *April*

D) *Ringed seal*

Source: *Climate Change and Wildlife, Climate Change Connection*

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Stop 3:

Aquatics - 2 Points

True or false?

Phosphorus (P) is often the limited factor in the production of algal blooms in lakes.

T F

Answer: True
Source: A-2, Page 42.

Urban Ecology - 2 Points

Under **ideal** conditions, the amount of organic matter added to streams and rivers will be **small** enough so that it can be readily decomposed and removed by aquatic micro-organisms; under these conditions, productive, aesthetically pleasing streams and rivers will be maintained. The **capacity** of streams and rivers to process such added organic matter is, however, **limited** and if too much organic matter is added, the water will become polluted.

Give **two (2)** examples whereby **excess** of organic matter can enter a stream or river system.

_____ (1 point)

_____ (1 point)

Answer:

Point source pollution: Release of inadequately treated municipal wastes and other materials from a specific location along the river or stream.

Non-point source pollution: Runoff from fields and feedlots, which causes eutrophication.

Added organic matter causes distinct and predictable changes in the aquatic microbial communities

Source: Page 509, Urban Ecology binder

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Forestry - Climate Change - 2 Points

The world's forests remove about _____ gigatons (billion tons) of carbon (C) from the atmosphere every year.

Answer: 60

Source: *Climate Change and Forests*

Soils - Climate Change - 10 Points

- A) Besides the reduction of fossil fuel consumption, provide five (5) additional ways to reduce greenhouse gas emissions from agriculture. (5 points)

- B) Tillage over the last 100 years has decreased organic matter content to less than 5% on most agricultural soils. Describe how this has also affected the following soil characteristics. (5 points)

Water holding capacity _____

Porosity _____

Bulk density _____

Aggregate stability _____

Colour _____

Answers:

- A) *Five of the following:*

- *Match fertilizer to crop requirements*
- *Apply manure according to crop needs*
- *Incorporate fertilizer*
- *Improve soil aeration, to prevent anaerobic conditions*
- *Use a less volatile form of nitrogen, such as NO_3 , instead of NH_4*
- *Improve feed efficiency of livestock to reduce methane production*

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- *Compost manures and organic waste products*

B) *Water holding capacity (less)*
Porosity (decrease large pores)
Bulk density (increase)
Aggregate stability (increase)
Color (decrease, less dark)

Source: *Best Management Practices - Soil Management*

Wildlife - 2 Points

The increased, upward trend in the white-tailed deer and beaver populations can be attributed to a combination of what factors? Provide two factors.

Answer:

Forest clearing has created suitable habitat and an abundant food supply; the decline of wolves and cougars has reduced deer and beaver mortality; and carefully regulated hunting and management programs have benefited these species.

Source: *Forest Wildlife, page 4*

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Stop 4:

Aquatics - 2 Points

What portion of planet Earth is covered in water? (Place a mark before the correct answer).

_____35% _____55% _____75% _____95%

Answer: 75%

Source: A-3, Pg. 2.

Urban Ecology - Climate Change - 2 Points

Name two (2) ways whereby urban trees contribute to greenhouse gas reduction in the atmosphere?

Answer:

- *directly remove carbon through sequestration*
- *reduces energy needs (for cooling and heating by planting around buildings)*

Source: Benefits of Urban Trees, Tree Canada

Forestry - 10 Points

A) Three (3) reasons forests and trees are measured, are: (3 x 2 = 6 points)

B) Tree diameters are measured at what standard height above the ground? (2 points)

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C) True or False? (2 points)

Tree ages can only be determined from dead trees or stumps.

T F

Answer:

A) Calculate volume/AAC, calculate growth rates, determine site productivity, document forest health, predict future development

B) Diameter at Breast Height or dbh, (1.3 meters)

C) False

Source: Forestry Equipment at Spring Workshop

Soils - Climate Change - 2 Points

From the list below, using an 'X', select two (2) best practices which could be used to manage the riparian corridors of the Assiniboine River in order to reduce greenhouse gas emissions.

___ Cutting the grass in the parks along the river

___ Periodic flooding

___ Planting/restoring riparian vegetation

___ Maintaining a good gravel cover on the trails to prevent soil compaction

___ Using deep rooted native species

Answer:

- *Planting/restoring riparian vegetation*

- *Using deep rooted native species*

Source: Observation

Wildlife - 2 Points

What are two primary causes for the rapid decline of some forest songbirds?

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Answer:

Forest fragmentation and the loss of habitat along the migration routes, due to urbanization and agricultural developments.

Source: *Forest Wildlife, page 5*

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Stop 5:

Aquatics - 2 Points

State the two (2) processes of the hydrologic cycle whereby water is moving downwards through the environment.

Answer: Precipitation and percolation or infiltration

Source: A-3, Pg. 3.

Urban Ecology – Climate Change -2 Points

A) What greenhouse gas is produced by landfill sites? (1 point)

B) Suggest an alternative to releasing this gas into the atmosphere? (1 point)

Answer:

A) Methane,

B) It can be captured to produce electricity and or heat.

Source: Landfills, Environmental Science

Forestry - 2 Points

EQUIPMENT REQUIRED

Using the Native Trees Guide provided, please identify the two marked trees. (1 point each)

A) _____

B) _____

Answers: To be determined

Source: Native Trees of Manitoba

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Soils - Climate Change - 2 Points

Agriculture accounts for what per cent of Manitoba greenhouse gas emissions? Place a mark in front of the best answer using an 'X'.

___5% ___15% ___33% ___76% ___80%

Answer: 33%
Source: *Climate Change and Agriculture*

Wildlife - 10 Points

A) Circle the correct answer for each of the six questions. (6 points)

- | | | |
|--|------|-------|
| 1) White-tailed deer invaded Manitoba from the southeast in the 1960's. | True | False |
| 2) Cottontail rabbits resided in Manitoba before 1920's. | True | False |
| 3) The Tall-Grass Prairie Preserve near Tolstoi was established in 1989. | True | False |
| 4) The first wildlife management area was established in 1961. | True | False |
| 5) Wild turkeys are native to Manitoba. | True | False |
| 6) Raccoons were rare in Manitoba prior to 1950. | True | False |

B) What four (4) basic habitat needs do all living things require? (2 points)

C) If any one of the above factors is in short supply, the numbers and distribution of wildlife are reduced. Because of this, what are these factors called? (1 point)

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- D) Explain what happens to animals when space is restricted. (1 point)

Answers:

- A) False, False, True, True, False, True
- B) *Food, Water, Shelter or Cover, Space*
- C) *Limiting factors*
- D) *Overcrowding leads to severe competition for food and breeding sites, and eventually to malnutrition and rapid spread of disease and parasites.*

Source:

- A) *Status and History of Wildlife, page 9*
- B) *Lesson 4 Ecology and Wildlife Management*
- C) *Lesson 4 Ecology and Wildlife Management*
- D) *Lesson 4 Ecology and Wildlife Management*

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Stop 6:

Aquatics - 2 Points

What portion of the world's water supply is not salt water? Place a mark in front of the best answer using an 'X'.

_____ 5% _____ 18% _____ 55% _____ 97%

Answer: 5%
Source: A-4, Pg. 1.

Urban Ecology – 10 Points

A) What are two approaches that you would take in constructing a walking trail through an urban forest. (2 points)

B) What are four (4) benefits of community gardens to a city? (4 points)

C) Commercially constructed buildings have a profound impact on our natural environment, economy, health and productivity. LEED (Leadership in Energy and Environmental Design) promotes buildings that are environmentally responsible, profitable and healthy places to live and work.

1. Name two (2) buildings in downtown Winnipeg that embrace this vision. (2 points)

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-
2. What are two (2) strategies that LEED certified buildings incorporate into their infrastructure? (2 points)
-
-

Answers:

- A) *Avoid sensitive areas, minimize interference with wildlife, use mulch/boardwalks in wet areas, use existing disturbance, don't make a straight trail;*
- B) *Source of food, aesthetic improvements, increased soil health, reduction in transportation costs, cultural connections, increased diversity of land use;*
- C) *1) Mountain Equipment Coop;
2) CIER*

Source: Urban Binder

Forestry - Climate Change - 2 Points

Name two (2) processes or methods by which forests can act as carbon **sources** under global warming. (1 point each)

Answer: Forest fires, increased forest litter decomposition

Source: Special Issue CFS Climate Change

Soils - 2 Points

The rise and fall of ancient civilization has been linked to the rise and fall of irrigated crop production.

- A) What is the cause of lost soil productivity on irrigated land? (1 point)
-

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- B) What is the term used in its measurement? (1 point)

Answer:

- A) *Salinity*
B) *Electrical conductivity*

Source:

- A) *Ontario Soil Conservation Kit material*
B) *Best Management Practices; Soil Management*

Wildlife - 2 Points

- A) Detailed records on Manitoba's animals, plants and plant communities at risk, together with their known location are maintained in the

_____ system of the Wildlife and Ecosystem Protection Branch (1 point).

- B) How is the information used? (1 point)

Answer:

- A) *Biological Conservation Data*
B) *To assess the conservation status of each species;
Predict the impacts of projects on species and their habitat
Assist conservation or development planning
Support ecological research and monitoring
Educational purposes*

Source: *Managing Animals, Plant & Habitats, Species at Risk*

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Stop 7:

Aquatics - 10 Points

EQUIPMENT REQUIRED

- A) Identify this test: (2 points)

- B) Examine the test tubes which were inoculated with Assiniboine River water and subsequently incubated (37°C, 48 h).

Using the provided Table, calculate the Most Probable Number (MPN) of coliforms of this particular river sample? (2 points)

- C) Based on the results, how would you rate the quality of this water as to its potability? **And Why?** (3 points)

- D) Based on the results, how would you rate the quality of this water as to its quality for recreation? **And Why?** (3 points)

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Answer:

A) *Multiple-Tube Fermentation Test or **Presumptive** test of the Multiple-Tube Fermentation Test.*

B) *5,3,0.....78 MPN*

C) *The water would **not** be potable because the number of coliforms exceeds the allowable limit recommended by Current Microbiological Standards, i.e. 1 positive sample found in:*

- *< 40 samples/month*
- *< 5% positive samples found in > 40 samples/month*

D) *The water would be safe for recreation involving direct contact (swimming, etc.) because the number of coliforms does NOT exceed the 200 coliforms/100 mL, recommended for safety.*

Source: *Urban binder (p. 519)*

Urban Ecology - 2 Points

Provide two (2) purposes for remediating contaminated sites? (1 point each)

Answer:

- *Reduce or mitigate damage to health and the environment*
- *Restore land to useful purposes*

Source: *Urban Ecology Binder page 614*

Forestry - 2 Points

Give two (2) methods used by researchers with the Manitoba Model Forest to track woodland caribou migration and forest habitat needs?

Answer: *GPS or Global Positioning System and VHF-radio collars.*

Source: *Manitoba Model Forest Updates*

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Soils - 2 Points

Which Canadian Land Inventory rating group for agricultural soils is affected the most by urban sprawl in Western Canada? Place a mark in front of the best answer using an 'X'.

_____ Classes 1-2 _____ Classes 3-4 _____ Classes 5-6 _____ Class 7

Answer: Classes 1-2

Source: Ontario Soil Conservation Kit material

Wildlife - 2 Points

Define the meaning of "species at risk."

Answer: Plants and animals that are in danger of extinction or extirpation throughout all or a portion of their range.

Source: Manitoba's Species at Risk fact sheets

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Stop 8:

Aquatics -10 Points

EQUIPMENT REQUIRED

- A) Using the measurement equipment provided determine the velocity of the streamflow at this location in the Assiniboine River. Assume this velocity to be representative of the average velocity for this river cross-section. The streamflow cross-section area at this location is 35 square metres (35 m²).

Determine the present streamflow in cubic metres per second (m³/sec) for the Assiniboine River at this location. (6 points)

Answer: $Q = V \times A$
To be determined

Source: *Field training*

- B) The two wetlands located south and east of the Discovery Centre contain 63 cubic dekametres (dam³) of water, at operating level. They often require filling and the Discovery Centre has a pump devoted to this task. The pump requires 23 days to fill them to operating level when they are empty. If the Assiniboine River's present streamflow was diverted into these wetlands when empty, how long would it take to fill them to their operating level? (4 points)

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Answer: *To be determined*

$$V = Q \times T$$

Source: *Field training*

Urban Ecology - 2 Points

A) What is a Brownfield site? (1 point)

B) Give two (2) examples of a Brownfield site that would be found in Brandon. (0.5 point each)

Answer:

A) *A site which is limited in its use and development potential as a result of residual contamination from previous operations and activities on that site.*

B) *Examples of former site:*

- *Service stations, tank farms where fuel storage tanks leaked*
- *Waste disposal grounds*
- *Industrial sites - asphalt manufacturing, timber treatment etc.*
- *Cattle corrals and barns*

Source: *p. 614, Urban Ecology binder*

Forestry - 2 Points

What is so unique about the Manitoba Model Forest's sister Model Forest in Mexico?

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Answer: The Monarch Butterfly Model Forest (Bosque Modelo Mariposa Monarca) is the winter home of millions of monarch butterflies

Source: Manitoba Model Forest Updates

Soils - 2 Points

A) Soils in riparian areas tend to be poorly developed, and often have buried horizons due to periodic flooding. To which Order do they belong? (1 point)

B) From what types of deposits were they formed? (1 point)

Answer:

A) Regosol

B) Alluvial

Source: Canadian System of Soil Classification

Wildlife - 2 Points

Name four (4) species which are currently listed as endangered in Manitoba. (0.5 points each)

Answer:

Baird's sparrow, Burrowing owl, Eskimo curlew, Loggerhead shrike, Peregrine falcon, Piping plover, Whooping crane, Uncas skipper, Small white lady's-slipper, Great Plains ladies'-tresses, Western prairie fringed orchid.

Source: Manitoba's Species at Risk fact sheets

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Stop 9:

Aquatics - 10 Points

EQUIPMENT REQUIRED

Using the transparency tube and SONDE test kit provided at this stop record the following:

- A) Secchi depth measurement (m) (2 points) _____
- B) Temperature measurement ($^{\circ}\text{C}$) (1 point) _____
- C) Dissolved oxygen measurement (mg/L) (1 point) _____
- D) Calculate the **per cent saturation** by dividing the dissolved oxygen concentration of your sample by the maximum concentration (100% saturation) at the temperature of your sample listed on the table provided at this stop. **Once you have the temperature refer to the table and write down the maximum concentration value in case you run out of time.** (2 points)

% saturation _____

- E) Per cent saturation indicates (circle the correct response) (1 point):
 - i) how much dissolved oxygen is in the water
 - ii) how much oxygen the water is capable of dissolving **or**
 - iii) the amount of oxygen consumed.
- F) Turbidity indirectly influences dissolved oxygen in two ways. What are they? (2 points - 1 point each)

- G) What would be the best way to minimize **turbidity** in the Assiniboine River and other waterways? (1point)

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Answers:

- A) TBA
- B) TBA
- C) TBA
- D) TBA
- E) ii
- F) Suspended sediments that cause turbidity absorb solar radiation which in turn increase the water temperature and highly turbid water also decreases the amount of penetrating sunlight which decrease photosynthesis and its by-product oxygen
- G) Erosion prevention

Source: Aquatics binder (A43) and field training

Urban Ecology - 2 Points

- A) What area in Canada has the worst air quality? (1 point)

- B) What technique is used to regreen cities such as Sudbury and Flin Flon that have been affected by "acid rain"? (1 point)

Answers:

- A) Windsor,
- B) Liming

Forestry - 2 Points

EQUIPMENT REQUIRED

Using the compass provided please determine the azimuth to the McKenzie Seeds Tower. (2 points)

Answer: 184°

Source: Forestry Equipment at Spring Workshop

Soils - 2 Points

EQUIPMENT REQUIRED

- A) Soils in poorly drained areas often have characteristic mottling or have a grey color. To which Order do they belong? (1 point)

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- B) Identify what is causing the white concretions in the sample provided.
(1 point)

Answer:

A) Salts

B) Clay

Source:

A) Observation

B) Manitoba Soil Survey Information and Land and Agriculture in the Canadian Prairies; R.A. Hedlin.

Wildlife - 2 Points

Name four (4) species that are currently listed as threatened in Manitoba.
(0.5 points each)

Answers:

Great Plains toad, Ferruginous hawk, Dakota skipper, Ottoe skipper Mule deer,
Culver's root, Riddell's goldenrod, Western silvery aster, Western spiderwort.

Source: Manitoba's Species at Risk fact sheets

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Stop 10:

Aquatics - 2 Points

True or false?

In terms of Canadian regional water use by sector (thermal power, manufacturing, municipal, agriculture, mining), the largest sector user in the prairie region is thermal power.

T F

Answer: False, it's agriculture.

Source: A-6, Pg. 5.

Urban Ecology - 2 Points

What are two (2) suitable uses of a floodplain? (1 point each)

Answer: Store floodwater, habitat for wildlife

Source: Urban binder

Forestry -10 Points

A) Manitoba's recently announced three (3) goals for forest management; these are: (3 points – 1 each)

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- B) Name the five (5) priorities that are essential in order to meet the goals listed in part A). (5 points – 1 each)

- C) Forest related activities provide work for how many Manitobans? Mark an 'X' in front of the correct response. (2 points)

_____ 10,000 _____ 12,000 _____ 13,000 _____ 15,000

Answers:

- A) *Protect ecosystems throughout the province*
Increase First Nations involvement (co-management, employment, economic development)
Become leader in sustainable forestry economy promotion
- B) *Increase scientific and traditional knowledge*
Enhance forest stewardship
Increase First Nations involvement and opportunities
Promote sustainable forestry
Update and improve legislation and guidelines
- C) 13,000

Source: *Next Steps*

Soils - 2 Points

One soil association in Manitoba, found in the Dauphin area, has a pH below 5.

- A) What is the typical range of pH in Manitoba soils? (1 point)

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B) **True or false?**

The soil close to the root may be 2 pH units different than the rest of the soil. (1 point)

T F

Answer:

A) *pH 7-8*

B) *True*

Source: A) *Best Management Practices; Soil Management*
B) *Soil Biology and Ecology*

Wildlife - Climate Change - 2 Points

How is climate change affecting butterflies in North America?

Answer:

Butterflies have been expanding their ranges northward by up to 200 km.

Source: *Climate Change and Wildlife*

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Stop 11:

Aquatics - 2 Points

The sediment cycle starts with the process of erosion, continues with the process of transportation and ends with what process?

Answer: Deposition or sedimentation.

Source: A-9, Pg. 1.

Urban Ecology - 2 Points

List four ways in which soil in urban areas is negatively affected?
(0.5 points each)

Answers: Higher temperature, lack of drainage, loss of O₂, contamination, loss of fertility, compaction

Source: Urban binder

Forestry - 10 Points

A) Define each of the following terms: (3 points each)

i) Afforestation:

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ii) Deforestation:

iii) Reforestation:

B) Approximately how many trees are planted annually in Canada? Place a mark in front of the correct answer with an 'X' (1 point)

____ 100 million ____ 300 million ____ 600 million ____ 900 million

Answer:

- A) i) *Afforestation – conversion of land from unproductive uses back into forests,*
ii) *Deforestation – clearing of forests with no replanting into agriculture or other uses,*
iii) *Reforestation – regenerating or renewing harvested areas to produce new forests.*

B) 600 million

Source:

- A) *Sources: A and R - What Trees can do..., D - MFA Clearcutting*
B) *Certification and Canada's forest, pg 4*

Soils - 2 Points

Emergence of crops may be slower in the spring in a zero tilled field?

A) What would be the cause of this difference, as compared to a well-tilled field? (1 point)

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B) What soil horizon is commonly in the 'Plow Layer'? (1 point)

Answer:

A) *cooler temperatures*

B) *Ap horizon or upper portion (~6") of Ah horizon*

Source:

A) *Best Management Practices; Soil Management*

B) *Canadian System of Soil Classification*

Wildlife - 2 Points

A) How often should a prairie be burned? (1 point)

B) Why can burning be destructive? (1 point)

Answer:

A) *It depends on the purpose of the burn and local moisture conditions.*

Properly timed burns can help decrease woody growth and the presence of weedy species without long-term detrimental effects.

B) *However, annual burns on mixed-grass prairie can be destructive over the long term, lowering moisture levels and destroying organic matter in the soil. Each prairie should be treated individually, according to the plant species present and the surrounding land use.*

Source: Mixed Grass Prairie in Manitoba

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Stop 12:

Aquatics - 2 Points

What is the name of the spring and fall mixing process that delivers oxygen and nutrients to the bottom of a lake?

Answer: Overturn

Source: A-2, Pg. 12.

Urban Ecology - 2 Points

Brandon intends to convert an empty uptown service station lot into a park for workers and nearby residents. What are four things that it should consider in its plan. (0.5 points each)

Answer: Does it need remediation?, Should it be replanted to grass?, Are trees to be planted?, Will a playstructure be included?, Can park be accommodated, Will there be flower beds?

Source: Urban Binder

Forestry - 2 Points

True or False?

- A) Canada has more of its original forest area than any other country in the world. (1 point)

T

F

- B) Canada has the second largest area of protected forests in the world. (1 point)

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T F

Answer:

A) True,

B) False

Source: (Certification) What buyers need to know

Soils - 10 Points

EQUIPMENT REQUIRED

- A) You have been handed a soil survey report. The parcel you have been asked to identify is classified as $2t^75w^3$: What does this mean? (2 points)

- B) What is the predominant soil in NW 1/4 1-11-15W? (2 points)

- C) What is the scale of the 'Soils of the Brandon Region Study Area report published in 1976? (1 point)

- D) Is this report appropriate for making site-specific decisions? (1 point)

- E) Why or why not? (1 point)

- F) What is the surface texture of a Brownridge soil? (1 point)

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- G) Would the construction of a septic field be appropriate on a Brownridge soil with no topographical constraints? Why or why not? (2 points)

Answers:

- A) 70% Class 2 with topographical constraints
30% Class 5 with wetness constraints
- B) Wellwood
- C) 1:20,000
- D) Yes
- E) 1:20,000 maps show more detail allowing site-specific decisions which a reconnaissance level report does not.
- F) Very fine sandy loam
- G) None to slight, moderately rapid permeability

Sources:

- A) p. 57 and p.247 Brandon Region Study
- B) Map 30, Brandon Region Study Area
- C) p. 72 Brandon Region Study Area
- D) p. 72 Brandon Region Study Area
- E) p. 72 Brandon Region Study Area
- F) p. 245 Brandon Region Study Area
- G) p. 97 Brandon Region Study Area

Wildlife - 2 Points

What two (2) types of management are used in order to maintain good quality native mixed grass prairie? (1 point each)

Answer: *Rotational grazing and occasional controlled burning.*
Source: *Mixed Grass Prairie in Manitoba*

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Stop 13:

Aquatics – 2 Points

True or false?

A common water quality parameter abbreviated “TDS” stands for “Temperature Dependent Solubility” and measures the solubility of oxygen gas in water.

T F

Answer: False, TDS measures Total Dissolved Solids in water.

Source: A-2, Pg. 44.

Urban Ecology - 2 Points

Where do the following urban centres get their drinking water?
(0.5 points each)

1) Winnipeg _____

2) Brandon _____

3) Selkirk _____

4) The Pas _____

Answers: 1) Shoal Lake, 2) Assiniboine River, 3) Red River, 4) Saskatchewan River

Source: Urban binder (C and D, pp 337-338).

Forestry - Climate Change - 2 Points

The southern margin of the boreal forest could shift dramatically as climate change makes Manitoba hotter and drier. Describe the magnitude of this predicted shift.

Answer: The southern margin of the forest could shift 150 – 200 km to the north.

Source: Climate Change and Forests, Climate Change Connection

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Soils - 2 Points

The carbon cycle has been described as 'the single most important element cycle in the soil'. Briefly describe what this is. (2 points)

Answer:

The carbon cycle, like all cycles, first converts inorganic matter into organic matter which is eventually converted back to inorganic matter. (i.e. a cycle) In the C cycle, the first stage involves photosynthesis which fixes inorganic carbon dioxide (CO₂) into organic glucose, which is the energy source to make plant matter. When the plant dies, decomposition (mineralization) converts organic plant matter back into inorganic carbon compounds.

Source: Soil Biology and Ecology

Wildlife - 2 Points

EQUIPMENT REQUIRED

The seven (7) native grass species displayed here were collected from the mixed grass prairie site at this Centre. Using the Guides provided at this stop identify **four (4)** of the 7 species. Either common or scientific name may be used. (Note: The samples are species grown in the 2003 season so their condition is that of what you would observe in late fall, winter and early spring before the new growth if you were trying to develop a plant species list at this area. (0.5 points each)

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Answer: *Four of the following:*

- A) *Big Bluestem (Andropogon gerardii)*
- B) *Canada Wild Rye (Elymus canadensis)*
- C) *Little Bluestem (Andropogon scoparius)*
- D) *Prairie Cord Grass (Spartina pectinata)*
- E) *Reed Canary Grass (Phalaris arundinacea)*
- F) *Side-Oats Grama (Bouteloua curtipendula)*
- G) *Switch Grass (Panicum virgatum)*

Source: *Field Guides provided*

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Stop 14:

Aquatics – 0 Points

Question deleted.

Urban Ecology - 2 Points

Other than the Red River, name two rivers that drain into Lake Winnipeg.
(1 point each)

Answer: Saskatchewan River, Winnipeg River
Source: Urban Binder

Forestry - 2 Points

True or False? (1 point each)

- A) Canada has as much protected forest as Sweden, Finland, Russia, Germany and UK combined.

T F

- B) *Clearcutting is a recognized and necessary forest management practice that is required to reproduce certain species and type of forests.*

T F

Answer:

A) *True*

B) *True*

Source:

A) *(Certification) What buyers need to know*

B) *Silviculture in Manitoba, MFA Clearcutting*

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Soils - 10 Points

EQUIPMENT REQUIRED

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

A) Soil Order (2 points)

B) Great Group (2 points)

C) Subgroup (2 points)

D) What is the depth of the Ah horizon? (1 point)

E) What is the pH of the B horizon? (1 point)

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

Answer: *TBD*
Source: *CSSC*

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Wildlife - 2 Points

In Manitoba, name two (2) types of endangered or threatened species would you find in the mixed grass prairie region. (1 point each)

Answer:

Small white Lady's slipper, Baird's Sparrow, Burrowing Owl, Loggerhead Shrike, Ferruginous Hawk

Source: Mixed Grass Prairie in Manitoba

Brandon Trail

Stop 1:

Aquatics - 10 Points

EQUIPMENT

Write your team number on the provided 8 ½" x 11" clear transparency and place it on the metal registration pins protruding from the 1:50,000 scale topographic map "MIAMI 62 G/8". The plastic keepers will hold it securely in place. Outline on the transparency, using the provided blue marker, the watershed contributing to Tobacco Creek at PR 240. This Tobacco Creek location is identified by a red arrow.

Insure that your team number is on the transparency and hand it in with your completed test.

Forestry - 2 Points

What percentage of the total chemical pesticides applied annually in Canada are used in forest management?

- a) 2
- b) 5
- c) 10
- d) 25

Answer: a

Source: Can. Perspectives on forest Pesticides

Soils - 2 Points

A) What is a Morainal Deposit? (1 point)

B) What is an Aeolian Deposit? (1 point)

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Answer: A) Parent material originating directly from glaciers
B) soils form by the deposition of wind. Predominately made up of sand and silt.
Source:

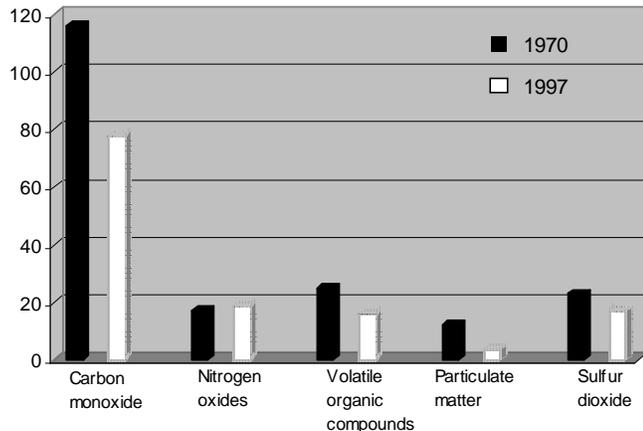
Urban Ecology – 2 Points

A) Canada's National Air Pollution Surveillance (NAPS) network measures atmospheric levels of five (5) common pollutants in cities. Circle the **one** that is considered Canada's most serious urban pollutant. (1 point)

- a) sulphur dioxide
- b) suspended particles
- c) ground level ozone
- d) carbon monoxide
- e) nitrogen dioxide.

B) Based on the graph below, which of the emissions did **NOT DECREASE** between 1970 and 1997? (1 point)

- a) volatile organic compounds
- b) sulfur dioxide
- c) carbon monoxide
- d) particulate matter
- e) none of the above



Answers: A) c, B) e
Source: Urban binder, p 4

Wildlife - 2 Points

Name the four major types of wetlands. (0.5 points each)

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Answers: ponds, marshes, swamps and peatbogs
Reference: Hinterland Who's Who – Wetlands

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Stop 2:

Aquatics – 2 Points

True or False (circle)

A stream's suspended sediment load is determined in a laboratory as the ratio of dry sediment weight per litre volume of water sample extracted from the stream.

T F

Answer: False. Concentration is the measure of the ratio of dry sediment weight per litre volume of water sample.

Source: Aquatics Binder (A9, Page 4)

Forestry - 2 Points

Which two (2) tree species make up 50% of the volume of Manitoba's forest growing stock.

Answer: Black Spruce and Jack Pine

Source: Manitoba's Forest

Soils - 2 Points

A) What are “**mycorrhizae**”? (1 point)

B) What is their function? (1 point)

Answers: A) fungus root, B) These are beneficial fungi that invade young lateral roots of most trees. Research indicates that mycorrhizae increase the surface area of roots, increasing the potential for nutrient (potassium) and water uptake. Mentioning either ecto – and/or endo-mychorrhizae is excellent.

Source: Urban binder, page 295

Urban Ecology - 2 Points

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Besides recycling programs, many Canadian municipalities now offer **compost** collection as a way to reduce household wastes. (0.5 points each)

Fill in the blanks:

During **composting**, microorganisms, such as (A) _____

and (B) _____ decompose dead (C) _____

into (D) _____, which are essential nutrients for plant growth.

Answers: A) and B) any two of the following: bacteria, fungi, actinomycetes, C) organic plant matter; also accept specific organic compounds such as carbohydrates, proteins, nucleic acids, etc, D) inorganic matter or minerals; also accept specific minerals such as nitrogen, phosphorus, etc.

Source:

Wildlife - 10 Points

Fur, sounds, tracks question

Answer:

Source: Field training

Stop 3:

Aquatics - 2 Points

EQUIPMENT

Using the guide provided identify the aquatic plant in the photograph (can use either the common or scientific name).

Answer: TBA

Source: Aquatics Binder, A16

Forestry - 2 Points

A) In 2001, Manitoba's Annual Allowable cut was: (1 point) Circle

a) 8,500,000 m³

b) 8,700,000 m³

c) 8,900,000 m³

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d) 9,100,000 m³

B) In 2001, the actual amount harvested was: (1 point) Circle

a) 2,200,000 m³

b) 2,400,000 m³

c) 2,600,000 m³

d) 2,800,000 m³

Answer: A) c, B) a

Source: Manitoba's Forests

Soils - Climate Change - 2 Points

Describe the impact of increased carbon dioxide on the growth of wheat.

Answer: wheat increases its photosynthesis rate, converting more CO₂ to sugars, starches and cellulose, increased CO₂ also suppresses photo-respiration making wheat more water-efficient.

Source: Climate Change and Agriculture

Urban Ecology - 2 Points

A) What are “coliforms”? (1 point)

B) What is the environmental significance of “coliforms”. (1 point)

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Answers: **A)** bacteria which make up approximately 10% of the intestinal micro-organisms of humans and other animals. They have found widespread uses as indicator organisms for fecal pollution in foods and water. Specific examples are: *Escherichia coli* (*E. Coli*), *Klebsiella pneumoniae* (*K. Pneumoniae*), *enterococcus aerogenes*.

B) the presence of coliforms suggests contamination of the water from sewage and other animal wastes. Although coliforms themselves are not harmful (non-pathogenic), animal and human wastes may also carry a number of harmful viral, bacterial, and protozoan pathogens, or disease-causing micro-organisms in addition to the normal micro-organisms of the gut. Coliforms are used as indicators of "probable" presence of such pathogens.

Source: Urban binder, page 518

Wildlife - 10 Points

- A) Explain how Canada geese have become nuisances in many areas. (2 points)

- B) What are three (3) problems associated with an over population of geese? (3 points)

- C) How many pounds (kilograms) of wet excrement does one single goose produce? (1 point)

- D) Name four (4) wildlife management techniques. (2 points – 0.5 points each)

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E) Why are hunting seasons generally set for the fall? (2 points)

Answers:

- A) *Birds thrive under the close protection and feeding opportunities they find in parks, near suburban wetlands, and on lawns or golf courses. Because no hunting takes place in these areas, there are few natural factors working to limit population growth and disperse the birds (ie. No natural predators)*
- B) *Droppings on lawns and beaches, which may contaminate drinking water sources, aggressive behaviour toward humans and collisions with aircraft*
- C) *3 pounds or 1.4 kilograms*
- D) *1)research, 2)monitoring, 3)refuges, 4)management areas, 5)seasons and bag limits, 6)habitat management and conseravation, 7)hunting and trapping, 8) public education, 9)compliance (laws), 10)co-operative co-management or joint management agreements, 11)species re-introduction*
- E) *primary reason hunting seasons are set for fall is to remove excess animals from a given population before winter, when competition for food becomes a limiting factor.*

Sources: A) and B) Hinterland Who's Who – Canada Geese, C) Urban Geese Case Study – March Workshop, D) and E) Lesson 4 Ecology and Wildlife Management

Stop 4:

Aquatics - 10 Points

EQUIPMENT

- A) Using the key and glossary of terms provided at this stop identify this fish to species. You may use the common or scientific name. (6 points)

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B) What family does this species belong to? (2 points)

C) Is this fish native to Manitoba? (1 point) (circle)

Yes **No**

D) Aquatic organisms have been intentionally introduced or transferred for several reasons. Name four (4). (2 points – 0.5 points each)

Answers: A) carp or Cyprinus carpio, B) Cyprinidae, C) No, D) for human food or forage for other aquatic organisms; to fill perceived “vacant niches” in specific aquatic communities; to enhance diminished populations of a selected species; to create new recreational and commercial fisheries; to re-establish extirpated species; to create refuges for species or strains that are threatened with extinction in their native habitats; to increase production from aquatic ecosystems (aquaculture) and to introduce species for biological control purposes.

Source: Aquatics binder (A31, page 4)

Forestry - 2 Points

What percentage of the area harvested is typically treated for forest regeneration? (2 points)

- a) 15 %
- b) 25 %
- c) 50 %
- d) 75 %
- e) 100 %

Answer: d

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Source: Manitoba's Forests

Soils - 2 Points

Name four (4) ways that agriculture can help reduce greenhouse gas emission through soil management.

Answer: increase zero tillage, reduce summerfallow, conversion of cropland to perennial cover, include more perennial forages in crop rotations

Source: Climate Change and Agriculture

Urban Ecology - 2 Points

What is xeriscaping? (0.5 points) List three (3) ways in which xeriscaping can be beneficial. (0.5 points each)

Answer: A water efficient landscape using plants adapted to the area. Requires less maintenance, less fertilizer and reduces the use of pesticides and other chemicals, requires less water

Source: Urban binder, page 708

Wildlife - 2 Points

Climate change scenarios for Manitoba suggest that we will experience hotter summers. The average number of 30+ °C days during the summer could

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increase from 13 to 37 days. How could this rise in average summer temperature impact reproduction in western painted turtles?

Answer: A small increase in temperature (2-4 degrees) could dramatically reduce the number of male turtles as sex ratios are temperature-dependant.
Source: Climate Change and Wildlife, Climate Change Connection

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Stop 5:

Aquatics - 2 Points

EQUIPMENT

Using the key provided at this stop identify the invertebrates. You may use common or scientific names. (1 point for each)

a. _____

b. _____

Answers: a, TBA b, TBA
Source: Aquatics binder, A14

Forestry - 2 Points

Brandon is located in what Ecoregion of Manitoba?

Answer: Aspen Parkland
Source: Manitoba's Forest

Soils - 2 Points

The standard method of measuring soil moisture content consists of drying a soil sample in an oven at 100 degrees C to constant mass and determining the resulting change in mass. It is assumed that the latter represents the amount of water in the original soil sample. This is referred to as the gravimetric water content and is expressed as a percent.

Calculate the gravimetric water content (expressed as a percent) of the following experimental data:

Mass of beaker plus wet soil	169.5 grams
Mass of beaker	100.0 grams
Mass of beaker plus dry soil	150.0 grams

Answer: $19.5/100 \text{ grams} * 100 = 19.5 \%$
Source: Calculation

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Urban Ecology – 2 Points

Name two (2) ways that a city impacts its surrounding rural area.

Answer: air pollution, water pollution, loss of soil

Source: Urban binder

Wildlife - 10 Points

EQUIPMENT

TBA – investigative scene crime

Answer:

Source:

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Stop 6:

Aquatics - Climate Change - 2 Points

Name two ways that aquatic ecosystems (lakes, rivers, streams and wetlands) provide services and benefits to Manitobans.

Answer: contribute to biodiversity, flood control, water filtration/purification, hydroelectric generation, recreation and tourism opportunities, habitat for economically important fisheries, locations for hands-on learning experiences.
Source: Climate Change and Water, Climate Change Connection

Forestry - 2 Points

List four (4) non-timber forest products. (0.5 points each)

Answers: syrup (maple or birch), medicinal plants, mushrooms, berries and fruit, ecotourism, xmas trees and boughs, craft materials, etc.
Source: Manitoba's Forests

Soils - 2 Points

If a soil contains 25 % clay and 5 % organic matter, what is the approximate CEC? (Assume a pure clay mixture has a CEC of $60 \text{ cmol}^+ \text{ kg}^{-1} = 25 \text{ cmol}^+ \text{ kg}^{-1}$)

Answer: $0.25 \times 60 \text{ cmol}^+ \text{ kg}^{-1} + 0.05 \times 200 \text{ cmol}^+ \text{ kg}^{-1} = 15 + 10 = 25 \text{ cmol}^+ \text{ kg}^{-1}$
Source: Calculation

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Urban Ecology - 10 Points

A) Fill in the blanks. (2 points)

A typical municipal **drinking water** treatment process uses **slow sand filters** to remove sediment and water-borne pathogens such as (1) _____ and **chlorine, ozone or UV radiation** to kill (2) _____.

B) Name four (4) possible sources of microbial contamination of drinking water (2 points – 0.5 points each).

C) During the municipal sewage treatment, activated sludge from **aerobic** (or oxygenic) digestion are further treated by **anaerobic digestion** (in the absence of oxygen).

Give two (2) advantages of anaerobic digestion. (2 points)

Give two (2) disadvantages of anaerobic digestion (2 points)

D) In municipal sewage treatment processing, what does the acronym AAO signify. (2 points)

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Answers: A1) any one of: *Giardia lamblia* cysts or *Cryptosporidium* oocysts, *Cyclospora*; also accept protozoan cysts, A2) any one of: bacteria or viruses, B)leaking septic tanks or sewers from home and/or commercial establishments; migratory birds; inadequate disinfection; industrial waste; hog and other animal operations; feedlots, etc., C)reduction of the bulk of the microbial biomass produced during aerobic digestion; production of methane (CH₄), which can be utilized for heating purposes; anaerobic sludge occupies less volume and can be dried easily; can be disposed of on land or in water; can be treated further (aerobically) to remove more pathogens and oxidize smelly ammonium and sulfide to odourless oxidized forms. D)concentration of heavy metals and other environmental contaminants; long-term environmental and public health effects from disposal of this material on land or in water; concentration of viable cysts of free-living protozoa; when sludge is spread near water, the parasite, as for example *Acanthamoeba*, can infect swimmers. The name protozoan – *Acanthamoeba*. E)stands for Anaerobic-Anoxic-Oxic; this indicates that anaerobic and aerobic treatment processes often are used together in a carefully designed sequence. This complete sequence has 3 stages: the anaerobic (A) processing of waste; Treatment of this product with nitrate under anoxic conditions (A) to promote denitrification and “polishing” the effluent under aerobic (oxic) conditions (O) before release into the environment.

Source: Urban Resource binder (pages 501; 463; 513-514 and 515)

Wildlife - 2 Points

EQUIPMENT: Decoy and Birds of Manitoba book

- A) Using the birds of Manitoba book, identify the two (2) ducks floating in the pond.

Answer: TBA

Source: field guide and Wildlife binder

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Stop 7:

Aquatics - Climate Change - 2 Points

Bluegreen algae have a tolerance for the higher water temperatures that will be caused by climate change. Why are they less desirable than cool water forms? (Identify two (2) reasons for 1 point each)

*Answers: bluegreen algae are known to **produce toxins** that are harmful to animals (including fish and humans). They also have **less nutritional value** for zooplankton species that feed on them.*

Source: Climate Change and Lake Winnipeg, Dr. Alex Salki for Climate Change Connection

Forestry - 2 Points

Declination is:

Answer: The difference in degrees between magnetic north and true or geographic north

Source: How to use a compass, also Spring Workshop

Soils - 2 Points

What is the role of potassium in plant growth?

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Answer: resistance to disease; vigour and strength

Source: Soil and Plant Ecology - Teacher's Manual, page 33

Urban Ecology – 10 Points

Examine the forest from its edge and then go down into it. Answer the following:

- A) What evidence do you see in this woodland that indicates it is under some form of stress? (Give 5 pieces of evidence for 5 points)

- B) Why do you think this woodland is in this condition? (1 reason for 1 point)

- C) *What is meant by urbanization? (provide 2 key definition ideas for 2 points)*

- D) In terms of agriculture economy, what is the problem with urbanization? (Give two (2) aspects for one point each = 2 points)

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Answers: A) Any five of the following: low tree species diversity; many dead trees with bark sloughing off them; decayed trees with woodpecker holes in them; prominently decay fungus growth on the tree near the pathway; low woody shrub diversity in the under story; low density of woody shrubs in the under story; low density tree canopy; low species diversity of ground plants on the forest floor or wet soils or poorly drained.

B) Seepage of water from the pond is permanently keeping the water table high in the flood plain. Periodic flooding of the woodland from the river.

C) any two of the following: reference to vacant lands, reference to urban fringe areas or areas just outside of developed urban lands, mention could be made of urban sprawl or lands could be referred to as having natural, agricultural or vacant (no use) designations to them.

D) any two of the following: **cut and paste from file at work**

Source: (A & B no reference), C & D Urban Ecology Binder, pages 337-338

Wildlife – Climate Change - 2 Points

How is climate change affecting red and Arctic foxes in Canada?

Answer: Red foxes are expanding their range northward

Arctic foxes are retreating further north as their habitat shrinks.

Source: Climate Change and Wildlife

Stop 8:

Aquatics - 2 Points

No aquatics at this stop.

Forestry - 2 Points

Other than carbon dioxide, name two additional naturally occurring greenhouse gases.

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Answer: Methane and Nitrous Oxide

Source: Tree Canada: What Trees can do to reduce atmospheric CO2

Soils - 10 Points

- A) Identify the growth attached to the rock (or log). (1 point)

- B) Name two (2) micro-organisms associated with this growth (2 points).

- C) Briefly describe the ecological significance of this growth. (7 points)

Answer:

Source: Not given

Urban Ecology - 2 Points

- A) Tree pruning is essential to maintaining the health and aesthetics of a tree. Making a proper cut reduces long-term problems like hollows, vertical cracks, ring shakes, etc. If you were asked to cut this branch (flagged) off where would be the proper place to make the cut:

A or B

- B) There are a number of reasons why branches need to be removed and help to determine which branches should be removed. Name one (1).

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Answer: A) b, B) dead or broken; diseased or dying; rubbing against another branch; interfering branch (ie hanging too low or rubbing against the house; competing with stronger branches for the sun
Source: Urban binder, page 674-675

Wildlife - 2 Points

List two reasons why this fallen tree plays an important role in the forest ecosystem.

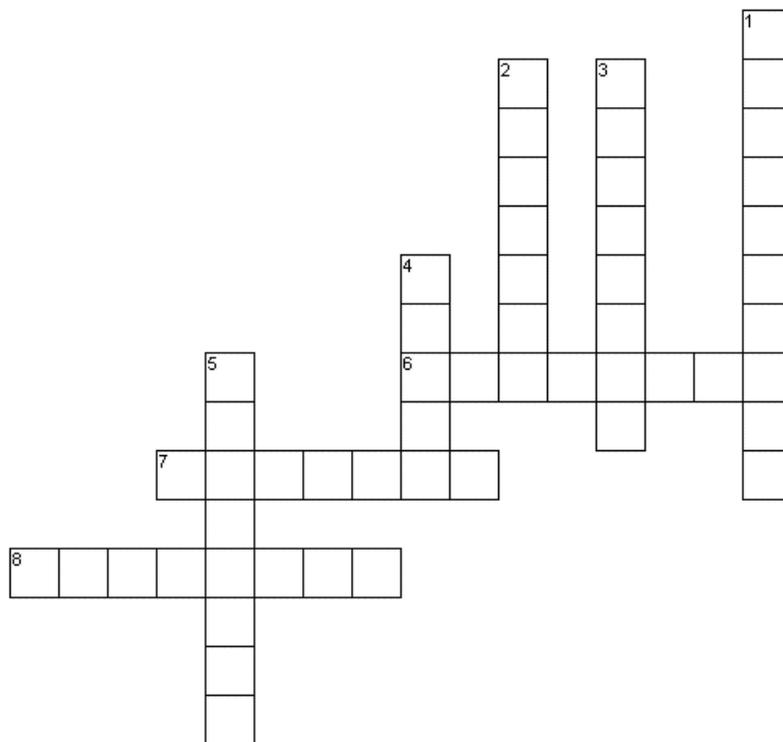
Answer: creates an opening in the forest canopy and exposes seedlings, shrubs and herbs to sunlight; provides food, shelter and breeding sites for many small wildlife species.
Source: Wildlife Binder - Effects of Forest Management on wildlife page 12

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Stop 9:

Aquatics - 4 points

Using the clues along the side, fill in the "Ecosystem" crossword puzzle. (0.5 points each)



Down

1. breaks down and feeds on non-living matter
2. place in which an organism lives
3. shallow area along shoreline, critical to production of rooted plants
4. an organism's role or "job" in the community
5. plants that use the sun's energy to make food for other forms of life

Across

6. emergent plants found closest to the shore and most tolerant of water fluctuations
7. more than one food chain
8. cannot make their own food must feed on other organisms to live

Answers: 1) decomposer, 2) habitat, 3) littoral, 4) niche, 5) producer, 6) cattails, 7) food web, 8) consumer

Source: Aquatics Binder, A2, pages 62, 87-92

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Forestry - 2 Points

- A) How many European tree feeding insect species have successfully invaded North America? Circle (1 point)
- a) 50
 - b) 100
 - c) 200
 - d) 300
- B) How many North American tree feeding insect species have successfully invaded Europe? Circle (1 point)
- a) 14
 - b) 24
 - c) 34
 - d) 44

Answer: A) d, B) c
Source: Alien Forest Pests

Soils - 2 Points

What is a LFH layer?

Answer: A thin surficial organic layer on soil, such as leaf litter. OR It refers to the relative degrees of litter decomposition from fresh litter (L) to finely broken down (humified) organic material in which the original structures are undiscernible (H).
Source: page 22, Soils and Vegetation 2203/6, Lab Reading #3

Urban Ecology - 2 Points

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Zoning is a common type of land-use regulation. When a land is zoned, it is designated for specific potential uses. Name four (4) common zoning designations. (0.5 points each)

Answer: Agriculture, Commercial, Residential, Recreational, Industrial
Source: Urban binder, page 60

Wildlife - 2 Points

How will the increases in surface temperature, precipitation and frequency of severe weather affect wildlife species? (4 ideas – 0.5 points each)

Answers: Difficult to predict, but some species will adapt, some will move to new areas, some will gradually die off and some will be replaced by other species that are better adapted to the new conditions.

Reference: Environment Canada – Climate Change and Wildlife, page 1

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Stop 10:

Aquatics - 2 Points

EQUIPMENT:

A) Identify the two external features referred to on this fish. (1 point – 0.5 points each)

1. _____

2. _____

B) What type of scales does this fish have? (You can remove some from the specimen if needed) Circle (1.0 point)

a. ctenoid

b. cycloid

c. ganoid

d. placoid

Answer: A1) lateral line, A2) pelvic fin, B) TBA

Source: Aquatics Binder, A19, A 20

Forestry - 2 Points

True or False (circle) (2 points - 1 point each)

A) Canada has the largest area of certified forests in the world.

T

F

B) Canada has as much protected forest as Sweden, Finland, Russia, Germany and UK combined.

T

F

Answer: A) T, B) T

Source: (Certification) What buyers need to know

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Soils - 2 Points

What is argillipedoturbation?

Answer: Effect caused in Vertisolic soils with high clay content when cracks rehydrate (after partially refilling with topsoil) causing increased pressure causing fault planes called slickensides.

Source: page 22, Soils and Vegetation 2203/6, Lab Reading #3

Urban Ecology - 2 Points

A) The average Manitoban uses 350 litres of water every day – two and a half times the amount used per person in Europe. Which activity uses the largest portion of household water. Circle (0.5 points)

- a) showers and baths
- b) toilet flushing
- c) laundry and dishes
- d) drinking and cooking

B) Household water is wasted in many ways and can be used more wisely by incorporating the three (3) R's. What are they? (0.5 points each)

*Answer: A) b, B) **reduce** your water use, **repair** leaks in taps, toilet tanks and pipes, **retrofit** older and inefficient toilets, showerheads and faucets with water saving equipment*

Source: Aquatics binder, A11, page

Wildlife - 10 Points

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- A) The number of animals that an area will support without damage to the habitat or to the animals is called? (2 points)

- B) Determine if the following are predators or prey? Circle the correct answer for each (8 points).

Rabbits	Predator	Prey
Ruffed Grouse	Predator	Prey
Wolves	Predator	Prey
Lynx	Predator	Prey
Squirrels	Predator	Prey
Owls	Predator	Prey
Gophers	Predator	Prey
Racoons	Predator	Prey

Answer: A) Carrying capacity, B) prey, prey, predator, predator, prey, predator, prey, predator

Source: A) Lesson 4 Ecology and Wildlife Management, B) Predation – Duck Unlimited Canada Nature Notes

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Stop 11:

Aquatics - 2 Points

The following is a list of the total number of invertebrates collected in a kick sample from the Assiniboine River.

- | | | |
|---------------------|-------------------|-------------------|
| 2 stonefly larva | 3 fishfly larva | 1 caddisfly larva |
| 1 water penny larva | 2 crane fly larva | 14 midgefly larva |
| 2 crayfish | 4 aquatic worms | |

Using the following table and the data above determine the Water Quality Rating.

Sensitive	Somewhat Sensitive	Tolerant
<input type="checkbox"/> Caddisfly larvae	<input type="checkbox"/> Beetle larvae	<input type="checkbox"/> Aquatic worms
<input type="checkbox"/> Hellgramite	<input type="checkbox"/> Clams	<input type="checkbox"/> Blackfly larvae
<input type="checkbox"/> Mayfly larvae	<input type="checkbox"/> Crane fly larvae	<input type="checkbox"/> Leeches
<input type="checkbox"/> Gilled snails	<input type="checkbox"/> Crayfish	<input type="checkbox"/> Midge larvae
<input type="checkbox"/> Riffle beetle adult	<input type="checkbox"/> Damselfly larvae	<input type="checkbox"/> Lunged snails
<input type="checkbox"/> Stonefly larvae	<input type="checkbox"/> Dragonfly larvae	
<input type="checkbox"/> Water penny larvae	<input type="checkbox"/> Scuds	
	<input type="checkbox"/> Sowbugs	
	<input type="checkbox"/> Fishfly larvae	
	<input type="checkbox"/> Alderfly larvae	
	<input type="checkbox"/> Watersnipe larvae	
# boxes checked x 3 = _____ index value	# boxes checked x 3 = _____ index value	# boxes checked x 3 = _____ index value

Water Quality Rating Excellent (>22) Fair (11-16)
 Total Index Value = _____ Good (17-22) Poor (<11)

Answer: Total Index Value of 17, Good
 Source: None needed

Forestry - Climate Change - 2 Points

As carbon dioxide levels double in the atmosphere, the SSR for forest fires is expected to increase by 40%. What is the SSR?

Answer: Seasonal severity rating
 Source: (Climate Change and Forests, Climate Change Connection)

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Soils - Climate Change - 2 Points

A) Nitrous oxide release is greatest in what season?

B) Under what soil moisture conditions is nitrous oxide release the greatest?

Answers: A) *spring*, B) *saturated*

Source: Global Warming and Agriculture - Nitrous oxide SCCC Factsheet

Urban Ecology - 10 Points

A) Which two (2) trees are **not** considered indigenous or native to this southern Manitoba valley habitat? Circle the correct answers (2 points – 1 point each)

1. Manitoba maple
2. Green ash
3. White spruce
4. American elm
5. Japanese tree lilac

B) Which two (2) woody shrubs **are** considered indigenous or native to this southern Manitoba valley habitat? Circle the correct answers (2 points – 1 point each)

1. lilac
2. red osier dogwood
3. saskatoon berry
4. Tartarian honeysuckle
5. Common caragana

C) What are the major causes of urbanization? (4 points – 1 point for each)

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D) *What is the urban heat island? (2 points – 1 point for each of the 2 aspects)*

Answers: A) 3 and 5, B) 2 and 3

C) Answer should have four of the following ideas:

- 1. Urban fringe areas have usually been in agricultural use, and are under pressure to become drawn into the existing built up municipality.*
- 2. The value of urban fringe agricultural lands lies in the profits farmers can make by selling the land to building/subdivision land developers.*
- 3. Urban fringe agricultural lands under municipal ownership have higher taxes than rural agricultural lands.*
- 4. Urban fringe agricultural and vacant lands are subject to increased trespassing and vandalism.*
- 5. Urban fringe agricultural lands are subject to regulations that restrict the movement of farm equipment on major urban roads and highways.*
- 6. The use of pesticide sprays and/or the spreading of manure and/or the rearing of animals on urban fringe agricultural lands often draw complaints from suburban homeowners living at the edge of the urban development.*
- 7. Population growth pressure in municipal areas requires new land for residential and commercial expansion.*

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8. *Urban people increasingly want to move to acreage properties in rural areas near their urban municipality. This is a rural lifestyle issue that is becoming more popular.*

D) *The answer should have **two of the following** ideas:*

1. *The concept is based on the heat released from human activities concentrated in cities.*
2. *The heat release comes from fuel combustion from buildings, vehicles and industrial processes.*
3. *The air in the urban centre area is usually warmer than the surrounding non-urban area.*
4. *The localized heat build up is known as an urban heat island.*

Source: Urban Ecology binder A) pages 41, 42, 44, 386, 387, 389, B) pages 386, 389, C) pages 338 and 616, D) page 575

Wildlife - 2 Points

Explain the “cyclic population” relationship between snowshoe hare and lynx. (2 points)

Answer: Lynx, because of their large well-furred feet, are physically adapted to pursuing snowshoe hare and feed almost exclusively on them. Both populations follow a ten-year cycle of boom and bust. The cycle of the lynx follows that of the snowshoe hare by one or two years. When snowshoe hare numbers reach their “low,” the lynx population responds with a lower survival rate of young and a lower reproductive rate in females because of the reduced food source.

Source: Lesson 4 Ecology and Wildlife Management

Stop 12:

Aquatics - Climate Change - 2 Points

2004 Manitoba Envirothon Team Number: _____

Many fish species may have to migrate north as water bodies at lower latitudes becomes too warm. What characteristic of Canadian river systems will make it more difficult for our fish to escape the warming caused by climate change?

Answer: Many of our major river systems run East/West.

Source: Climate Change and Wildlife, Climate Change Connection

Forestry - 10 Points

EQUIPMENT

Using the **Suunto** and **Diameter Tape** provided, measure the tree indicated. Record your measurements in the spaces provided and using the tree volume equation given and the calculator provided, calculate the tree volume.

Diameter (dbh): _____ cm (2 points)

Height (h): _____ m (2 points)

Volume (V):

$$V = a + b \times dbh^2 \times h$$

For cottonwood and aspen:

$$a = -0.03315$$

$$B = 0.0000462$$

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Volume: _____ m³ (6 points)

Answers: to be determined

Source: Forestry Equipment at Spring Workshop

Soils - 2 Points

How does groundwater cause soil salinity?

Answer: Much of the bedrock and subsoil contain high concentrations of salts. When groundwater comes in contact with these layers, salt is dissolved out. The wicking effect draws the water to the surface which is then able to evaporate.

Source: Prairie Soils - The Case for Conservation, page 2

Urban Ecology - 2 Points

Photochemical smog, which results when there is not enough wind to disperse the pollutants, can have a serious health effect on humans. Name two (2) of these effects. (1 point each)

Answer: asthmatic attacks worsen; risk of contracting respiratory diseases such as bronchitis increases; danger of developing certain types of cancer can increase

Source: Urban binder, page 4

Wildlife - 2 Points

The marshy areas of the wetland provide excellent escape cover for which birds two (2) while moulting?

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Answer: mallards and teals

Source: Hinterland Who's Who – Wetlands

Stop 13:

Aquatics - 2 Points

Aquatic invertebrates have unique adaptations depending on where they live. Looking at the samples provided at this stop determine if the structure used or invertebrate is adapted to live in the Assiniboine River or this pond (Circle answer). Give one reason you chose the answer you did.

a) Assiniboine River Pond

Why _____

b) Assiniboine River Pond

Why _____

OR sort a sample and determine pollution tolerance index for Assiniboine R.

Answer: TBA

Source:

Forestry - 10 Points

A) Canada contains what percentage of the world's forests? (1 point)

a) 1

b) 2

c) 5

d) 10

B) What is Canada's rank in the world as a forest product exporter? (1 point)

a) 1

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- b) 2
- c) 5
- d) 10

Answers: A= d, B = a
Source: Forestry Binder Introduction

C) Name the two organisms that comprise lichen (2 points)

Answers: fungi, algae
Source: From Rock to Tree

D) The problems associated with “fire exclusion” are: (2 points)

Answers: allows fuels to build up to high levels and makes fire more difficult to control, prevents natural cycles and ecological processes.
Source: Forest Fire Management in Manitoba

E) Indicator plants are used to: (4 points – 1 each)

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Answer: predict ecological conditions, classify soil drainage, indicate soil fertility, describe environmental characteristics

Source: Indicator Plant Species for Canadian Forests

Soils - 2 Points

What causes blue-baby syndrome? How is bodily function impaired?

Answer: High nitrate concentrations in water supplies. Nitrate is converted to nitrite in the stomach and is then absorbed into the bloodstream which interferes with hemoglobin and therefore impairs oxygen entering the bloodstream causing discoloration of skin and mouth.

Source: Nitrates in Soil and Water, Factsheet #4, Living with Livestock Production

Urban Ecology - 2 Points

No question at this stop

Wildlife - 2 Points

Natural wetlands are a vital natural resource and a critical part of our environment. Constructed wetlands, which mimic the basic components (i.e. soils, aquatic plants, and water) of natural wetlands, are increasingly employed in the treatment of liquid wastes and for bio-remediation.

- A) Name two (2) different plant types that can be used in “constructed” wetlands. (1 point – 0.5 points each)

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- B) Briefly explain the role of the micro-organisms in such “constructed wetlands”. (1 point)

Answers:

A) **Any 2** of the following (page 515):

Free-floating macrophytes such as duckweed and water hyacinth;

Emergent macrophytes, such as bulrushes, which will allow surface flow as well as vertical and horizontal subsurface flow for waste treatment;

Submerged vegetation, such as waterweed, which will allow final “polishing” of the water.

B) Micro-organism associated with the sediment and the plant roots will hasten degradation (mineralization) of the organic matter in the system. In addition, certain anaerobic bacteria (as for example Desulfovibrio) will trap heavy metals. Emergent plant systems are particularly useful in the processing of waters from abandoned mines

Source: Urban Ecology, page 515

Stop 14:

Aquatics - Climate Change - 2 Points

Climate change is expected to effect the amount of runoff. Runoff transports more than water into lakes, rivers and streams. Runoff carries DOC from the surrounding watershed into water bodies.

- A What does DOC stand for?

- B Why is DOC critical to the health of aquatic organisms.

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Answer: A Dissolved organic carbon, B. prevents the penetration of harmful ultraviolet radiation into the water column. A lack of DOC can result in sun burned fish.

Source: Climate Change Package: Climate Change and Water

Forestry - 2 Points

Annually, how much of Canada's managed forest is harvested? (2 points)

- a) 1 %
- b) 5 %
- c) 10 %
- d) 15 %

Answer: a

Source: (Certification) What buyers need to know

Soils - 2 Points

EQUIPMENT

Identify the following. What is the primary function?

Answer: Nodule on legume (what is function)

Source: Observation

Urban Ecology - 4 Points

It is blue box recycling day and you need to **circle** the items shown below that **can be** recycled. (0.5 points for each item circled)



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Answer: pop bottle, newspaper, carton, pop can, wine bottles, tuna tin, box, tin can

Source: general knowledge

Wildlife - 2 Points

- A) Give the common name of the plant shown in the photograph provided at this stop. (1.0 points)

- B) What European insect is used as a biological control agent? (1.0 points)

Answers: A) Purple loosestrife, B) Nanophyes marmoratus

Source: Wildlife Binder, Purple loosestrife fact sheet.