

Beaver Island Trail with Answers

Stop 1:

Aquatics - 2 Points

List four different types of activities that can result in increased nutrient and contaminant concentrations in surface waters.

Answers: Site preparation, shoreline alterations, stormwater management, groundwater extraction, dredging and filling, land clearing, soil cultivation, crop management practices. Aquatics binder, pages 83 – 86.

Ag Land – 2 Points

What are two key features of conservation agreements? (2 points)

Answer: A key feature of conservation agreements (CA) is the fact that ownership does not change. The CA only identifies the habitats on the property that are to remain protected. The land remains privately owned and can be used for agricultural or other uses, as long as the habitat remains protected.

When a CA is signed a caveat is placed on the land title. The habitat protection defined by the CA remains in place when the land changes hands.

Source: Envirothon Workshop, Conservation Agreements session

Forestry - 2 Points

EQUIPMENT

Using the compass provided, please determine the approximate bearing to the Jack Pine (double orange flag down the road – Stop 11)

_____ °

Answer: To be determined

Soils - 2 Points

A) Why are sulphates held loosely by the soil compared to potassium?
(1 point)

Answer: Anions repelled as opposed to cations

Source: Soils '84, pp. 10-11.

B) Gleysolic soils are commonly found under what conditions? (1 point)

Answer: poorly drained/depressional areas

Source: Soils '84 p. 18.

Wildlife - 10 Points

A) There are typically four types of "wetlands", what are they? (4 points)

B) List four benefits of wetlands/ponds to agriculture production and the environment. (4 points)

C) Name two ways livestock damage wetlands: (1 point, 0.5 each)

D) What is one way to maintain and protect your wetland?

Answers: A marshes;swamps;bogs;fens B limit flooding by storing runoff and acting like reservoirs; help water flow continuously; purify water; reduce soil erosion by acting as a buffer against flowing water either into or through the system; return water to the atmosphere, stream base and ground water sources; offer habitat for species that help control insect and rodent infestations; provide fish habitat, including spawning, rearing and feeding areas; provide a source of water incase of a fire; provide recreational opportunities C eat and trample vegetation; add excessive nutrients D if one is there do nothing; maintain or add a buffer strip

Reference: Theme Binder: Best Management Practices - Water Management

Stop 2:

Aquatics – 2 Points (1 each)

A) What unique thing happens to water once it gets colder than 4 degrees C?

B) What would happen to our lakes and rivers if this did not occur?

*Answer: A. Water begins to become less dense and lighter, expanding slighter in the process and floats upward toward the surface.
B. Ice would form on the bottom and destroy aquatic life.
Reference: Aquatics Binder (page 3)*

Ag Land - 2 Points

What are the impacts of allowing cattle in the stream, and in the riparian area on fish? Provide two impacts. (2 points)

*Answer: Sediment in water can decrease fish spawning success by covering eggs. If there is no woody vegetation, due to overgrazing, the water temperature may be too high
Source: Envirothon Workshop, Riparian session*

Forestry - Climate Change - 2 Points

How far north is the Southern margin of the boreal forest predicted to shift?
Circle the correct answer.

- A < 50 km.
- B 50 – 100 km.
- C 100 – 150 km.
- D > 150 km.

Answer: D

Source: Climate Change and Forests, page 3.

Soils - 10 Points

EQUIPMENT

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 organic material? (1 mark)

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

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

Answers: To be determined

Source: Canadian System of Soil Classification

Wildlife - 2 Points (0.5 each)

List the four habitat requirements of wildlife.

Answer: food, shelter, water and space

Reference: Wildlife Binder - Forest Wildlife, page 7

Stop 3:

Aquatics - Climate Change - 2 Points

Name two of the four environmental stresses that currently affect our aquatic ecosystems and will do so at a greater magnitude with the implications of climate change.

Answer: pollution, habitat destruction, fragmentation and introduction of exotic species

Reference: Climate Change Package: Aquatic Ecosystems & Global Climate Change

Ag Land - 2 Points

What is exclusion fencing (1 point) and where is it used? (1 point)

Answer: Exclusion fencing is fencing to keep livestock out entirely from an area. Often used along streambanks and sensitive riparian zones.

Source: Envirothon Workshop, Riparian session

Forestry - 10 Points

A) With regards to forest products certification, what does the term "Chain-of-custody" mean? (4 points)

Answers: Refers to the ability to track wood from the time it leaves the forest, through the processing and marketing channels to the final consumer.

Reference: Certification and Canada's forests, pg 5

B) How many of the Forest Regions of Canada occur in Manitoba?
(2 points). Circle

A 4

B 5

C 6

Answer: B

Reference: Forest Regions of Canada Map

C) In your own words define the term "value-added manufacturing" as it pertains to wood products. (2 points)

Answer: The difference between total revenue and the cost of all purchased materials, supplies and services. It includes payments to labour, depreciation, profits and taxes.

Source: Forestry binder, Manitoba Forests page 6

D) In your own words define the term "employment multiplier" as it pertains to the forest industry (2 points)

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.

Reference: Manitoba's Forests pg 8.

Soils - 2 Points

How do pulse crops, like beans, get nitrogen? (2 points)

Answer: Pulse crops fix the nitrogen through nodules on the roots, where bacteria remove N from the atmosphere.

Source: Envirothon Workshop, Agronomy session

Wildlife -Climate Change - 2 Points

Describe how the polar bear is impacted by climate change.

Answer: The polar bear needs stable sea ice as a solid surface to hunt seals. With climate change, the polar bears' hunting season gets cut short and they do not have enough time to regain their strength.

Source: Binder Material: Climate Change and Wildlife, Climate Change Connection, 2002

Stop 4:

Aquatics - 2 Points

EQUIPMENT

Looking at the two larval fish provided, what two features can you use to differentiate one larval fish from another?

Answer: post and preanal myomeres, yolk sac, chromatophores, length

Reference: April 11th workshop material

Ag Land - 2 Points

What is a watershed? (1 point) Give an example. (1 point)

Answer: The area from which water drains into a river or a lake, which is contained within some geographical or topographical boundary.

Examples: Swan Lake basin, Assiniboine River watershed, etc.

Source: Envirothon Workshop, Riparian session

Forestry - 10 Points (2 each)

A) Name the three most important tree species in Manitoba (by volume of growing stock).

Answers: Black spruce, Trembling Aspen and Jack Pine

Source: Manitoba's Forests, page 3.

B) What percentage of Manitoba's Annual Allowable Cut was harvested in 1991? Circle

- A 20%
- B 40%
- C 60%
- D 80%

Answer: A

Source: Manitoba's Forest, page 4.

C) Approximately how much of Canada's forests are harvested annually? Circle

- A 0.5 million hectares
- B 1.0 million hectares
- C 1.5 million hectares
- D 2.0 million hectares

Answer: B

Reference: Certification and Canada's forests, pg 4

Soils - 2 Points

State how the following are altered, in general, by increased clay content:

Water infiltration (1 point)

Pore size (1 point)

Answer: Water infiltration decreases, pore size decreases

Source: Soils '84, p. 6.

Wildlife - 2 Points

A) What bird made this hole in the marked tree?

B) What type of insect in the tree the bird was feeding on?

Answer: pileated woodpecker; carpenter ants

Reference: General knowledge

Stop 5:**Aquatics - 10 Points****EQUIPMENT****A.** Using the boat go-out, anchor at the buoy and do the following:

- a. collect a bottom sample using the ekman dredge and bring in a portion using equipment provided (1pt) _____
- b. what is the name of the black and white disc? _____ and take a measurement with it _____ m (1 pt)
- c. record the following parameters: oxygen _____
(1pt)
temperature _____
pH _____

B. Answer the following questions (1 point each):

- d. What is the above disc used to measure? _____
- e. What side of the boat should you take this measurement from?

- f. The pH scale is _____, therefore water with a pH of 5 is how many times more acidic than a pH of 7? Circle
10 2 100 1000
- g. The matter collected in the Ekman dredge consists of: _____ and _____ material.

C. Fish Anatomy (3 points – 1 point each)

h. Using the "Key to Manitoba's Sport Fish" provided at this site, identify the following:

Fish A: _____

Fish B: _____

Fish C: _____

Answers: A. completion of getting a sample B. secchi, TBA C. TBA D. transparency E. shady F. logarithmic, 100 G. plant and animal H. TBA
Reference: Aquatics binder, April 11th workshop material

Ag Land – 2 Points

A) Manitoba has approximately how many farms? (1 point). Circle

- A 1,000
- B 11,000
- C 21,000
- D 31,000
- E 41,000

Answer: (21,071) C

Source: Envirothon Workshop, Agronomy session

B) Manitoba has approximately how many acres of improved land for agriculture? (1 point). Circle

- A 3 million
- B 12 million
- C 19 million
- D 57 million
- E 105 million

Answer: 11.65 million (B)

Source: Envirothon Workshop, Agronomy session

Forestry - 2 Points

Insect outbreaks result in, on average, greater annual timber losses than forest fires. Circle.

True

False

Answer: True

Source: Climate Change Impacts and Adaptations, page 8

Soils - 2 Points

State how the following are altered, in general, by increased clay content:

Total pore space (1 point)

Water holding capacity (1 point)

Answer: Total pore space increases, water holding capacity increases

Source: Soils '84, pp. 6-7.

Wildlife - 2 Points (1 each)

A) What animal made the structure identified by the stake with flagging tape on it?

B) Looking over the area that resulted from this animal's activity, name one benefit that this landscape provides to other animals.

Answer: beaver; creates prime habitat for animals such as moose, deer, snakes, turtles, and countless insects; waterfowl come in; algae, pond weed and large number of inverts flourish providing a plentiful food supply for fish, reptiles, amphibians and birds.

Reference: Wildlife Binder: Beaver Management Fact Sheet

Stop 6:

EQUIPMENT

Aquatics - 2 Points (0.5 each)

- A) What zone of the lake does the flagging tape refer to?

- B) What is the one feature of this zone that allows various plants to grow and thrive?

- C) What plant category/community does this plant belong? Circle
- a. Emergent
 - b. free-floating
 - c. floating-leaf
 - d. submersed
- D) Which one of the above plant categories listed in C above is the most tolerant of fluctuating water levels?

Answers: A. littoral B. light penetrates to the bottom C. TBA D. emergent
Reference: Aquatics Binder (page 62,63)

Ag Land – 10 Points

- A) What is meant by the term "crop rotation" (2 marks)

- B) Give an example of a suitable 4 year rotation (2 marks)

C) Provide four benefits of crop rotation (4 marks).

Answers:

- *Crop rotation is the practice of growing a sequence of different crops on the same land.*
- *For example, in a four year rotation, there may be wheat, canola, barley and peas grown.*
- *Benefits of rotation include;*
- *Decreased diseases*
- *Lower weed pressures*
- *Less herbicide resistance developing in weeds*
- *Improved soil health if forages are included*
- *Less chemical usage*
- *Higher yields in the long term*
- *Improved water use efficiency of crops*
- *Diversified income base for producer*

D) What is Integrated Pest Management? (2 points)

Answer: Use of different methods to control pests and diseases, such as biological insect control, basing chemical use on threshold levels of insects, disease, or weeds, and tillage in combination with reduced chemical usage.
Source: Envirothon Workshop, Agronomy session

Forestry - 2 Points

While harvesting using a clearcutting system it is possible to ensure conservation of wildlife habitat, natural beauty and other uses such as recreation. Circle.

True

False

Answer: True
Source: Pulp and Paper, Clearcutting, page 4

Soils - Climate Change - 2 Points

What two sectors produce the majority of Manitoba's greenhouse gas emissions?
(2 points)

Answer: Transportation and agriculture
Source: Manitoba and Climate Change, p. 7

Wildlife - 2 Points

EQUIPMENT: Decoy and Birds of Manitoba book

A) What is the common name for the duck floating in the swamp.

B) What bird has the nesting box seen at this stop been created for?

Answer: TBA (mallard); wood duck
Reference: field training; wildlife binder

Stop 7:

Aquatics - 2 Points

List four characteristics of eutrophic waters.

Answers: warm, shallow, high TDS, high productivity, algal blooms, warm water species, low species diversity, reduced oxygen stability, high pH.
Aquatics binder, page 110.

Ag Land - Climate Change - 2 Points

How can greenhouse gases be sequestered or emissions reduced within agriculture? List two ways. (2 points)

Answer: increasing zero tillage, decreasing summerfallow, improving grazing strategies, or by converting croplands to wetlands and/or wildlife habitats.
Source: Primer, p.22

Forestry - 2 Points

Old Growth forests can be preserved forever in an unchanged condition. Circle

True

False

Answer: False

Source; Pulp and Paper, Old Growth Forests, page 1

Soils - 2 Points

- A) Why is land application of sewage sludge considered to be a problem?
(1 point)
-

Answer: Concern about heavy metals

Source: Health of our Soils, p. 87

- B) What is the general rule of thumb regarding nitrogen mineralization from manure being available to plants in the first year? (1 point)
-

Answer: 25-30%

Source: Manure as a Resource factsheet

Wildlife - 2 Points

List two reasons why a 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.

Reference: Wildlife Binder - Effects of Forest Management on wildlife page 12

Stop 8:

Aquatics - 2 Points

What is an aquifer?

Answer: An underground formation of loose rock or permeable material that can supply useful quantities of water when tapped by a well.

Source: Aquatics binder, Fact Sheet #5, page 2.

Ag Land - 2 Points

What are two benefits of GMO crops to farmers? (2 points)

Answer: Herbicide resistance so that overall chemical and tillage usage is decreased.

Source: Envirothon Workshop, Agronomy session

Forestry - 10 Points

Equipment: Haga, D-Tape, Tally Sheets, Calculator (with teams)

With the equipment and calculation sheets provided, determine the height and diameter and then using the tables provided to calculate the volume of trees "A" and "B". Record on the tally sheet provided.

Answers. 2 trees = diameters (2 mark each =4), height (2 mark each =4), correct volumes = 2 marks).

Reference: Workshop Equipment Demonstrations

Soils - 2 Points

A) What is the main concern regarding manure application to soils with limited internal drainage? (1 point)

Answer: denitrification or compaction

B) How would you minimize these concerns? (1 point)

Answer:

- ◆ *apply manure by injection, broadcast/incorporate*
- ◆ *Apply in the spring or fall when fields are dry enough to travel on*
- ◆ *Limit applications to appropriate soil test recommendations or 80 lb N/ac*
- ◆ *If denitrification has occurred, soil test to determine the amount of plant available nitrogen remaining in the soil and, if necessary, add nitrogen fertilizer to meet crop requirements*
- ◆ *Crop selection focus: deep rooted crops, flood tolerant crops, high water use crops, disease resistant crops*

Wildlife - 2 Points

What large mammal would be drawn to this wetland to feed on the aquatic vegetation?

Answer: moose

Reference: North America Wetlands page 69

Stop 9:

Aquatics – Climate Change - 2 Points (1 each)

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.

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.

Reference: Climate Change Package: Climate Change and Water

Ag Land - 2 Points

Why is the riparian zone important for maintaining biodiversity? (2 points)

Answer: 80% of wildlife species spend at least 20% of their life within this zone, do to their need for water and shelter.

Source: Envirothon Workshop, Riparian session

Forestry - 2 Points

Define indicator species

Answer: A species whose progress is monitored by people, as an indication of what is happening to the environment or habitat as a whole.

Reference: Forestry binder, Tomorrow's Forests Today's Challenge pg. 8

Soils - 2 Points

What are two ways that producers can help to improve water quality?

Answers:

- ◆ *Controlling the processes that move soil and agricultural inputs into water (erosion, runoff, and drainage)*
- ◆ *Improving the way in which agricultural inputs and waste are managed (fertilizers, manure and pesticides)*
- ◆ *Making use of buffer zones and shelterbelts*

Source; The Health of our Water, page 91

Wildlife - 10 Points

Our harsh winters and shortage of food have produced different adaptations by Manitoba's native animals. Match the animal to the adaption.

1. Deer	___ Counter current heat exchange system in their blood flow
2. Bats	___ Camouflage
3. Monarch butterflies	___ Cluster
4. Red squirrels	___ Hibernation
5. Polar bears	___ Soft dense underfur with coarse outer guard hair
6. Mice	___ Buries stores of acorns and seeds
7. Honey bees	___ Migrate
8. Snowshoe hare	___ Live in a thin layer of snow just above the ground
9. Muskrat	___ Body form designed to minimize heat loss
10. Ptarmigan	___ Large padded paws

Answers: 5, 10, 7, 2, 9, 4, 3, 6, 1, 8

Reference: Wildlife Binder pages 38-40

Stop 10:

Aquatics - 10 Points

EQUIPMENT

A) Aquatic Invertebrates: Using the key identify the following invertebrates and list their common name (3 pts):

1. _____
2. _____
3. _____

B) What physical property of water enables small organisms to live on top (like this water strider) or just underneath the film at the surface? (1 pt)

C) Water Quality Assessment: (6 points). From the sample provided, sort the inverts, identify them (using the laminated invert chart pinned to the table or keys) and determine the Pollution Tolerance using the Pollution Tolerant Appendix (provided at this stop). Record your results on the data sheet provided. **NB: please put your team number at the top of the data sheet and include with your test.**

Using the total number of broad taxonomic groups found in each tolerance category recorded on your data sheet, determine the pollution tolerance index using the following calculation:

$$3 \times (\# \text{ of Category 1}) + 2 \times (\# \text{ of Category 2}) + (\# \text{ of Category 3})$$

Pollution Tolerance Index

Good	Acceptable	Marginal	Poor
>22	17-22	11-16	>11

The Pollution Tolerance Index for this site is _____.

Answer: TBA, b surface tension

Reference: April 11th workshop and field training

Ag Land - 2 Points

What is pesticide free production? (2 points)

Answer: Pesticide free production; No chemicals are applied to the growing crop. Chemical application can occur pre seeding or post harvest. May be conventional or zero tillage. Reduces chemical usage. Usually higher yields than organic.

Source: Envirothon Workshop, Agronomy session

Forestry - Climate Change - 2 Points (0.5 each)

A) Which, if any, of these are considered “Greenhouse Gases”? Circle

- A CO₂
- B CH₄
- C N₂O
- D SO₂

Answer: a, b and c

Source: What trees can do to reduce....., page 2.

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

Answer: housing timber and furniture

Source: What trees can do to reduce...,page 6.

C) Burning fossil fuels accounts for approximately how much of the Enhanced greenhouse effect to date? Circle.

A 55%

B 65%

C 75%

D 85%

Answer: C

Source: Manitoba Conservation, What is Climate Change, pg 1.

Soils - 2 Points

A) A soil that has an electrical conductivity of 4 to 8 dS/m is considered to be _____. (1 point)

Answer: slightly saline

Source Soil and Terrain Technical Manual, p. 18

B) The Manitoba Crop Insurance Corporation uses a soil productivity index to rate soils in Manitoba. Which soil would be more productive? (1 point)
Circle

C or F

Answer: C

Source: Soils '84 p. 24

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.

Reference: Climate Change and Wildlife

Stop 11:

Aquatics - 2 Points

A small waterway's streamflow is measured to be 7 cubic meters per second and its relatively low suspended sediment concentration is measured to be 20 milligrams per liter. If these flow and sediment concentration conditions remain the same for the months of May and June, what total sediment load to the nearest tonne does the waterway carry past the measurement point during this period?

*Answer: $20 \text{ mg/l} \times 7 \text{ m}^3/\text{s} \times 1000 \text{ l/m}^3 \times 61 \text{ days} \times 24 \text{ hours/day} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/minute} = 7.3786 \times 10^{11} \text{ mg.} = 738 \text{ tonnes.}$
Source: Field training.*

Ag Land - 10 Points

- A) Briefly describe conventional, minimum, and zero tillage, highlighting the differences. (2 points each)

Answers: Conventional; several tillage operations may be used, to control weeds, and to incorporate fertilizer. Chemical applications can occur before crop emergence, after emergence, during crop growth, and after harvest. Tillage is done to prepare the seedbed, possibly for weed control, and following harvest.

Minimum Tillage; Less tillage than conventional, but with the same chemical management. Usually fall tillage is reduced or eliminated, to provide overwinter ground cover protection. Some spring tillage will be used to prepare the seedbed. Often the tillage implements have narrow openers, to reduce soil disturbance.

Zero tillage; This system only uses tillage with narrow openers to seed the crop. No tillage is used for weed control, or chemical applications.

B) What is the common method used to determine fertilizer requirements of the crop (2 marks), and how is it done? (2 marks)

Answers:

- Soil testing; Soil samples are taken from the 0-6 in, and 6-24 in depths, from many locations in a field. Samples may be combined, so that the 0-6 in, and 6-24 in depths are composite samples. A soil probe is the usual method of sampling. May be done with a truck mounted auger.*
- Soil samples are sent to a lab for analysis, and for fertilizer recommendations.*

Source: Envirothon Workshop, Agronomy session

Forestry - 2 Points

EQUIPMENT

A) What is the name of the equipment used to age trees?

B) Using the sample provided (and hand lens if required), determine the age of this Jack Pine tree.

_____ yrs.

Answers: A Increment Corer or Borer, Age TBA

Soils - 2 Points

A) What is an ungulate? (1 point)

B) Give an example. (1 point)

Answers: Animals with hooves such as deer, antelope and cattle

Source: Land Use and Society p. 63

Wildlife - 2 Points

There are currently extensive (implemented across a vast region) and intensive (narrowly designed) waterfowl management practices being used to address the decline in waterfowl populations. Give an example of each practice.

Extensive: _____

Intensive: _____

Answers: Extensive: chemical fallow(short term herbicides used and crops are seeded directly into residue), rotational grazing, undercutters: Intensive: planting dense nesting cover, constructing nest boxes, protecting nesting areas with electric predator proof fences

Fulford Farm Trail with Answers

Stop 1:

Aquatics - 10 Points

EQUIPMENT

What is the existing discharge in the West Favel River at this location? Show your calculations.

You are provided the following equipment and information:

- Two oranges, they have neutral buoyancy, will float just submerged within the water column and will proceed downstream with the same velocity as the streamflow.
- A stopwatch
- The orange lines painted on the sides of the culvert near the upstream and downstream ends are 16 meters apart.
- The streamflow cross-section through the road crossing (corrugated multi-plate arch culvert) is 3 meters wide and 0.2 meters deep.

Answer : to be determined onsite by Barry

Ag Land - 2 Points

A) Who has ultimate authority to regulate land use in Manitoba? (1 point)

Answer: local municipal governments

Source: Envirothon Workshop, Land Use Planning session

B) What piece of provincial legislation is the main mechanism for land use planning at the municipal level and sets out the procedures for the preparation, review and amendments to local development plans and zoning by-laws? (1 point) Circle

- A The Zoning Act
- B The Local Development Planning Act
- C The Planning Act
- D The Land Use Planning Act

Answer: C (The Planning Act)

Source: Envirothon Workshop, Land Use Planning session

Forestry - 2 Points

The usage of herbicides as part of sound forest management is very loosely regulated. Circle

- True
- False

Answer: False Source: Pulp and Paper, Control of Competing....page 2

Soils - 2 Points

EQUIPMENT

Using the textural triangle, determine the texture for these three soils.

- A. 45 percent clay and 45 percent silt: _____
- B. 28 percent silt and 56 percent sand: _____

Answer:

- A. Silty clay
- B. Sandy loam

Source: Using textural triangle provided.

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.

Reference: Climate Change and Wildlife

Stop 2:

Aquatics – 2 Points (0.5 each)

- A) What is sediment? _____
- B) Looking from this site identify one area which is contributing silt/sediment to the West Favel River . _____

- C) List one way suspended and deposited silt/sediment can harm fish.

- D) Suggest one method that could be used to limit or avoid silt and sediment from entering the stream.

Answers: A. mineral or plant material suspended in the water or wind B. road crossing, bank, field C. abrasion of gill members; impairment of feeding; clogs spaces between gravel - suffocation of eggs and/or ruins spawning areas all together; destroys habitat for aquatic inverts and fish rely on these for food; sheltered areas between boulders and gravel particles are eliminated and young fish need these areas D. shoreline planting; soft structures (soil bioengineering); erosion control blankets; seeding; rock rubble; gabion baskets; vertical retaining walls; and if working around water sediment/silk screen

Reference: Theme Binder: Agriculture BMP's: Water Quality Matters and Working Around Water? Fact Sheet #8 and #11 E. (National Test) Aquatics Binder and riparian handouts.

Ag Land - 2 Points

What two things should be done to prevent contamination from the surface into your well? (2 points)

Answer:

- *Capped and sealed*
- *Should divert surface water away from the well head and avoid ponding around the well*
- *Must be properly located*

Source: Best Management Practices – Water Management, p. 14

Forestry - 10 Points

A) Describe the difference between: (3 points each)

Afforestation:

Deforestation:

Reforestation:

Answers: Afforestation – conversion of land from unproductive uses back into forests, Deforestation – clearing of forests with no replanting into agriculture or other uses, Reforestation – regenerating or renewing harvested areas to produce new forests. Sources: A and R - What Trees can do....., D - MFA Clearcutting

B) Approximately how many trees are planted annually in Canada? (1 point)
Circle

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

Answer: C

Source: Certification and Canada's forest, pg 4

Soils - 2 Points

What is fugitive dust and provide an example? (2 points)

Answer: Fugitive dust is particulate matter which is transported by wind and redeposited elsewhere. Examples of common sources of fugitive dust include paved and unpaved roads, construction and demolition activities, industrial activities and soil erosion.

Source: Prairie Agricultural Landscapes, p. 25

Wildlife - 2 Points

The increased, upward trend in the white-tailed deer and beaver population can be attributed to a combination of what 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.

Reference: Forest Wildlife, page 4

Stop 3:

Aquatics - 2 Points

What portion of the earth's water is "fresh water" and what portion of that is "surface water"? In this context surface water excludes fresh water in the form of ice and groundwater. Circle

- A 95% and 5 % respectively
- B 5% and 0.01% respectively
- C 70% and 5% respectively

Answer: B. Aquatics binder, Freshwater series A-2, page 1.

Ag Land - 10 Points

EQUIPMENT

- A) Using the square foot provided, what is the plant population in this field on a square foot basis? (2 points)

Answer: To be determined

- B) What is the crop? (1 point)

Answer: To be determined

- C) Using the 'Field Crop Production Guide' is this plant stand ideal? (1 point)

Answer: To be determined

D) In a fertilizer formulation, such as 30-20-10-5, what nutrient percentages are the first number, second, third and fourth? (0.5 points each – 2 points)

1 _____ 2 _____ 3 _____ 4 _____

Answer: *nitrogen, phosphorus, potassium, sulphur*

E) What are two of the objectives for plant breeding work, to develop new varieties? (2 marks)

Answers:

- *Higher yield*
- *Disease resistance*
- *Height*
- *Lodging resistance*
- *Length of maturity*
- *Seed color*
- *Oil content*
- *Seed size*

F) What are the two major field crops grown in Manitoba, based on acres? (2 points)

Answer: *Wheat and canola*

Source: Envirothon Workshop, Agronomy session

Forestry - Climate Change - 2 Points

Between 1950 and 1995 Canada's west and north have seen a temperature increase of, Circle

- a) 0.5 – 1.5 ° C
- b) 1.6 – 2.5 ° C
- c) 2.6 – 3.5 ° C
- d) 3.6 – 5.0 ° C

Answer: b)

Reference: C&I for Sust. For. Mngt in Canada, National Status 2000, pg 30

Soils - 2 Points

EQUIPMENT

The legal land description of this site is NE_{1/4} 11-36-26WPM.

What is the soil capability for agriculture? (1 point)

What is the land capability for wildlife/waterfowl? (1 point)

Answers: *To be determined*

Source: CLI Maps

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.

Reference: Manitoba's Species at Risk fact sheets

Stop 4:

Aquatics - 2 Points

- A) Fish are cold blooded. When water temperatures increase, their body temperature increases which increases their _____ rate. This in turn increases their need for oxygen.
- B) As water temperatures increase does water contain more OR less oxygen. (circle the appropriate answer)

Answers A. metabolic B. less

Reference: Aquatics Binder (pages 7-8) and workshop material

Ag Land - 2 Points (0.5 points each)

The Provincial Land Use Policies are adopted as a Regulation under a provincial Act and outline the broader public interests in land use. The Provincial Land Use Policies are used as a guide for Municipalities when creating their own local development plans. The Provincial Land Use Policies encompass development policies in 9 broad policy areas. Name 4 of the 9.

Answer Any 4 of the following (General Development, Agriculture, Renewable Resources, Water and Shoreland, Recreational Resources, Natural Features and Heritage Resources, Flooding and Erosion, Provincial Highways, Mineral Resources)

Source: Envirothon Workshop, Land Use Planning session

Forestry - 2 Points

Name 4 "Non-Timber" Forest Products.

*Answer: Syrup (Maple or Birch), Mushrooms (Specialty or Wild), Christmas Trees (and boughs), Jam, Jellies and Cider, Willow Furniture, Birch Bark Crafts, Ecotourism
AND OTHERS - GET RULING FROM GLENN, Source: Agroforestry, April 11 Workshop*

Soils - 10 Points

EQUIPMENT

- A) What is the texture of the Ah horizon at the knoll? (1 point)

Answer: To be determined

- B) What is the structure of the Ah horizon at the knoll? (1 point)

Answer: To be determined

- C) A mild solution of hydrochloric acid is used to detect what mineral in the soil? (1 point)

Answer: lime or carbonates

- D) What information does this provide given its position in the landscape? (1 point)

Answer: amount of downward water movement (degree of leaching)

- E) Other than depth, what other difference is noted between the A horizons of the knoll and the depressional area? (1 point)

Answer: knoll position contains a buried horizon (Ahb)

F) How can you account for this? (1 point)

Answer: Periodic flooding

G) Using the Munsell colour charts, what color is the Ah horizon at the knoll (1 point)

Answer: To be determined

H) What is the depth of the Ah horizon at the knoll? (1 point)

Answer: To be determined

I) What is the depth of the Ah horizon in the depressional area? (1 point)

Answer: To be determined

J) How is one able to account for the difference in the depth of the Ah horizon between these two sites? (1 point)

Answer: Soil movement due to gravity

Source: Training session prior to Envirothon

Wildlife - 2 Points

Why is the blood of a honeybee yellow, while the blood of an earthworm is red?

Answer: There is no oxygen-carrying pigment in the blood. OR Oxygen is not transported in the blood as in the earthworm.

Reference: Supplement – The Plants and Animals of Manitoba, page 25 and 26.

Stop 5:

Aquatics - Climate Change - 2 Points

Under global climate change scenarios the timing of spring runoff in the Prairies is projected to occur; Circle

- A earlier
- B later
- C at the same time

Answer: a Canada – Water Vulnerable to Climate Change, page 3.

Ag Lands – 10 Points

A) Identify 2 problems within the riparian zone and propose solutions (4 points – 2 points (problems) and 2 points (solutions))

Answers:

Eroded streambank

Solution: planting willow, rock to stabilize bank

Lack of woody vegetation

Solution: planting willow

Alien Plant species

Solution: Planting of woody species

B) Identify four functions of the riparian zone. (4 points)

Answer:

- *Traps sediment running off of fields*
- *Reduces stream energy so helps to reduce erosion*
- *Maintains biodiversity of plant and animal species*
- *Creates primary production of grasses and woody species*
- *Builds streambanks by trapping sediment*
- *Stores floodwater*
- *Recharges the aquifer*

C) What type of off stream watering systems may be suited to this location?
List two. (2 points)

Answer:

- *Solar*
- *Windmill*
- *Electric*

Source: Envirothon Workshop, Riparian session

Forestry - 2 Points

A) A pioneer plant species is? (1 point)

B) Give two examples in Manitoba. (0.5 points each)

Answers:

A plant capable of invading and establishing on a newly exposed soil surface, for example after a forest fire or an abandoned farm field.

Source: Forestry Binder Glossary

Jack pine, trembling aspen, black spruce

Source: MFA Hows and Whys, 1. Clearcutting, page 10

Soils - 2 Points

Describe why not all water in the soil (rooting zone) is available for plant growth?

*Answer: Water is held on to the soil particles that the plant roots can not extract.
Permanent wilting point.*

Source: Best Management Practices – Soil Management, p. 16.

Wildlife - Climate Change - 2 Points

How will the increases in surface temperatures, precipitation and frequency of severe weather affect wildlife species?

Answer: It is 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

Stop 6:

Aquatics - 2 Points (1 each)

The runoff in many waterways experiences a peak or high discharge following snowmelt or rainfall events then, after several days, or weeks in a larger watershed, runoff subsides and continues at a much reduced or low discharge. The water in the high flow portion of the runoff hydrograph is mainly from surface runoff.

A) What is the name applied to the low flow portion of runoff?

B) What is the source for most of this runoff?

Answers: baseflow and groundwater. Aquatics binder, page 80.

Ag Land - 2 Points (1 each)

What are two types of carbonates most commonly found in agricultural soils in Manitoba?

Answer: calcium and magnesium

Source: Soils '84, p. 12

Forestry - Climate Change - 2 Points

Name 2 ways forestry practices can help reduce greenhouse gas emissions.

*Answer: Improve energy efficiencies in harvesting and processing
Increase reforestation to help sequester more carbon*

Source: Manitoba and Climate Change: A Primer

Soils - 10 Points

A) Based on your knowledge of the area and the landscape at this site.
What best describes how this site was formed? (1 point) Circle

- A Bedrock deposits
- B Fluvial deposits
- C Morainal deposits
- D Lacustrine deposits

Answer: Fluvial Deposits (B) or Morainal deposits (C)
Source: Soils '84 p. 13.

B) Why are there noticeably more stones at this location in the field? (1 point)

Answer: Elevation/glacial deposit and proximity to watercourse
Source: Soils '84 p. 13.

C) What are the two primary nutrients, which are a concern as agricultural runoff? (2 points)

Answer: Phosphorus and Nitrogen
Source: Envirothon Workshop, Agronomy session

- D) Improper fertilization/chemical treatments of lawns in urban areas can lead to pollution of surface and groundwater. Discuss how this problem could be minimized. Provide two ways. (2 points)

*Answer: Utilizing appropriate application rates
Following label directions*
Source: Envirothon Workshop, Agronomy session

- E) On agricultural land, list 2 sources of agricultural pollutants and what specific beneficial management practices could be used to address them. (4 points)

*Answer: -Fertilizers/manure (soil testing, manure testing, matching application rates to crop requirements, etc.)
-Pesticides (following label directions, calibration of sprayer, etc.)*

Source: Envirothon Workshop, Agronomy session

Wildlife - 2 Points (1 point each)

A) What is purple loosestrife?

B) Explain the impact of its introduction into Manitoba's ecosystems

Answers: A) Purple loosestrife is an invasive perennial weed that was introduced into North America in 1800s, B) Purple loosestrife destroys natural habitats, displacing native vegetation forming dense monotypic stands. Wildlife that depends upon native vegetation for food, shelter and breeding areas are forced to leave invaded habitats. Purple loosestrife threatens the survival of our wildlife and is responsible for significant habitat loss across Manitoba.

Reference: Purple loosestrife fact sheet.

Stop 7:**Aquatics - 10 Points****EQUIPMENT**

You are provided a 1:125,000 scale map titled, "PLAN OF LOWER ROARING RIVER AND FAVEL RIVER AREA showing DESIGNATIONS OF DRAINS" a blank transparency and a blue permanent marker. The square grid on the map is the existing road network. Your current location on the West Favel River is indicated on the map with a red arrowhead labeled "A". Given are the following two conversion factors; one square mile equals 2.59 square kilometers and one cubic decameter equals one thousand cubic meters.

Register the transparency on the map using the metal pins and draw with the marker on the transparency the contributing watershed for your location.

- A. Determine the watershed area in square miles. (5 points)

- B. Determine the direct runoff volume from this watershed in cubic decameters if it were to experience a 25 millimeter rainfall of which 17 millimeters were to infiltrate and 8 millimeters were to be shed as runoff. (5 points)

- C. **Remove the transparency and submit with your finished test.**
Note: Ensure your team number is written on the transparency

Answers:

- A. 41.6 square miles.
- B. $41.6 \text{ square miles} \times 2.59 \text{ square kilometers per square mile} \times 1,000,000 \text{ square meters per square kilometer} \times .008 \text{ meters} / 1000 \text{ cubic meters per cubic decameter} = 861.95 \text{ cubic decameters.}$

Answer source - Field Training.

Ag Land - 2 Points

What are two of the benefits of having woody species in the riparian zone?

Answers

- *Deep roots hold the soil together (better than shallow rooted grasses)*
- *Woody plants can provide shade, which will help lower water temperatures*
- *Woody species may use more nutrients, preventing less from entering surface or groundwater*

Source: Envirothon Workshop, Riparian session

Forestry - 2 Points

Globally, what percentage of vertebrates that are thought to be in danger of extinction are threatened by invasive species? Circle

- a) 10
- b) 20
- c) 30
- d) 40

Answer b)

Reference: Alien Forest Pests, pg 10

Soils - 2 Points

Name two problems associated with irrigated production?

Answer: salinity, nutrient management, wind erosion

Source: Land Use and Society, p. 36

Wildlife - 2 Points

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

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

Reference: Forest Wildlife, page 5

Stop 8:

Aquatics - 2 Points (1 each)

In this park a landscape depression feature (approximately 1 meter deep and 10 meters wide) encircles the childrens playground area.

A. What is the origin of this feature?

B. What is the vegetative indication that this feature has not been used for its original purpose for a long time (more than 50 years)?

Answers: A. The West Favel River abandoned a former meander loop (source: High School geography), B. large Poplars (>1 foot diameter) growing in the bottom of the oxbow scar. (source: field observation)

Ag Land - 2 Points

How can livestock grazing patterns be changed to prevent damage to the riparian areas? Provide 2 options. (2 points)

Answers

- Rotational grazing can be used to restrict access during early spring and fall, and to control the amount of grazing pressure
- Salt blocks can be placed away from the watering area, at the back of the paddock.
- Off stream watering should be used to keep cattle out of river.

Source: Envirothon Workshop, Riparian session

Forestry - 2 Points

What are the effects of livestock grazing on forest communities and how does it affect their function?

Answer: *Reduced biodiversity in plant species within the forest community, particularly the herb and shrub species. In hardwood dominated forests such as aspen a gradual thinning of trees is evidenced over time as trees are damaged by livestock and eventually die off. Suckering or propagation is also reduced as livestock will browse on new shoots or trample them. Soil compaction may also be increased. Forest functions such as providing quality habitat may be negatively affected along with the ability for snow/water retention, filtering and aquifer recharge.*

Reference: Onsite observation, Agriculture - riparian information

Soils - Climate Change - 2 Points

Between 1981 and 1996, what has the trend of agricultural emissions of the following been?

Nitrous oxide _____

Carbon dioxide _____

Answer: Nitrous oxide increasing
Carbon dioxide decreasing

Source: Environmental Sustainability of Canadian Agriculture, p. 14 (A Summary).

Wildlife - 10 Points (1 each)

EQUIPMENT

Equipment provided: Furs, skulls, wings, scat, browse, owl pellets, trail pictures, Know Your Ducks poster, field guides, sample wings, bird mount, frog picture, bone sorting chart, ruler, Language Master and sound cards, and beaver felt hat

A) Does this skull belong to an herbivore, omnivore or carnivore? _____

B) What did the owl have for dinner? Use the "bone sorting chart" to determine if the skull and/or bones inside the owl pellet are from a rodent, shrew, or bird.

C) This wing belongs to a duck that lives in wetlands in the boreal forest. Use the field guide to identify the correct species (Golden Guide, pages 64-65).

D) This hat was made from the fur of an aquatic rodent. Which pelt belongs to this mammal? What sound does this mammal make?

Pelt # _____ Sound card # _____

E) The hollow hair of this animal feels coarse. Name the animal.

F) Use the field guide to identify this bird (National Geographic).

G) Name this frog. What sound does it make?

Species name _____ Sound card # _____

H) This pelt is from an animal that prefers evergreen forest. Name the species. What sound does it make?

Species name _____ Sound card # _____

- I) Look at the tracks and scat left by this animal. Name the species. What is the straddle of the animal (in centimeters)?

Species name _____ Straddle measurement (cm) _____

- J) Was this twig browsed by a rabbit or a deer?

Answers:

1. *Herbivore (rodent, deer, or beaver)*
2. *Shrew*
3. *Lesser scaup*
4. *Beaver pelt, sound card # TBA*
5. *White-tailed deer*
6. *Northern hawk-owl*
7. *Species TBA (depends on picture or replica displayed), sound card # TBA*
8. *Red squirrel, sound card # TBA*
9. *Snowshoe hare (straddle measurement must be within a certain range)*
10. *Rabbit*

Stop 9:

Aquatics - 2 Points

Using the fish and equipment provided, please answer the following question.

A) What is the dorsal fin count for fish A?

B) What type of tail does fish B have? (circle the correct answer)

heterocercal homocercal

C) What type of fish scale is in dish C ? – use microscope if necessary (circle the correct answer)

Cycloid ctenoid

D) What kind of mouth does fish D have ?(circle the correct answer)

terminal inferior superior ventral subterminal

Answers: TBA, heterocercal, ctenoid, TBA

Reference: April workshop

Ag Land - 2 Points

What is organic production?

Answer: Organic farming; Farming without chemical inputs. Fields must be certified chemical free for three years before produce can be sold as organic. Fertilizer may be natural, such as rock phosphate, or straw based manures. Weed control is accomplished mostly by tillage, and by including forages into rotation to reduce annual weeds. Green manure, such as plowing down young yellow clover, is also used to add organic matter, nitrogen, and to improve soil

structure.

Source: Envirothon Workshop, Agronomy session

Forestry - 2 Points

Using the Field Guide to the Native Trees of Manitoba provided please identified the two marked trees.

Equipment: Field Guide

A: _____

B: _____

Answers: A., B. To be determined onsite

Soils - Climate Change - 2 Points

65% of agricultural emissions are derived from nitrous oxide and 30% derived from methane production. Name the major source for each.

*Answer: Nitrous oxide from fertilizers and soil tillage
Methane from livestock*

Source: Primer, p. 22

Wildlife - 2 Points

The red-sided garter snake is one of two species of garter snakes found in Manitoba. What is the other garter snake?

Answer: The western plains garter snake.

Stop 10:

Aquatics - 2 Points

Name two common disease-causing organisms found in water.

Answer: bacteria (fecal coliforms), viruses, protozoa: salmonella, norwalk virus, giardia, cryptosporidium

Reference: Clean Water Guide (page 19)

Ag Land - 2 Points

What is rotational grazing?

Answer: The practice of using fencing to divide a pasture up into paddocks, to control cattle movement, so that the cattle are only allowed to graze a particular area for a controlled length of time, to increase pasture productivity.

Source: Envirothon Workshop, Riparian session

Forestry - 2 Points

Define Annual Allowable Cut (AAC). What can it be compared to?

Answers: 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.

Source: Forestry binder, Tomorrow's Forests Today's Challenge pg. 8,

Soils - 2 Points

What are two methods of controlling salinity?

Answer:

- *Preventing and retarding the accumulation of water and salts in near-surface positions*
- *Lowering groundwater tables to reduce salinization rates*
- *Removing salts from the root zone*
- *Controlling the amount of water penetrating recharge areas*
- *Growing salt-tolerant vegetation*

Source: Prairie Agricultural Landscapes, p. 39

Wildlife - 10 Points

A) Circle correct answer (1 point each)

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

Answer: *False, False, True, True, False, True*

Reference: Status and History of Wildlife, page 9

B) Name four species that are currently listed as threatened in Manitoba.
(1 point each).

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

Reference: Manitoba's Species at Risk fact sheets

Stop 11:

Aquatics – Climate Change - 2 Points

The ecological consequences of climate change on aquatic ecosystems will largely depend on the rate and magnitude of change in two critical environmental drivers. What are they?

Answer: temperature and water availability from precipitation and runoff.
Reference: Climate Change Package: Aquatic Ecosystems & Global Climate Change

Ag Land - 2 Points (1 each)

- A) When can conflicts over land use occur? Circle
- A When more than one land use is proposed for the same parcel of land
 - B When people disagree over the best use of a parcel of land
 - C When two incompatible land uses are located in close proximity to one another
 - D All of the above
 - E None of the above

Answer: D (All of the above)
Source: Envirothon Workshop, Land Use Planning session

- B) What can be done to increase the earthworm populations in a soil?

Answer: Convert fields into no-till or plant forages. Manure has been shown to increase earthworm populations especially if conservation or no-till techniques are used.

Source: Best Management Practices – Soil Management, p. 25

Forestry - 2 Points (1 each)

A) How many European tree feeding insect species have successfully invaded North America? Circle

- a) 50
- b) 100
- c) 200
- d) 300

B) How many North American tree feeding insect species have successfully invaded Europe? Circle

- a) 14
- b) 24
- c) 34
- d) 44

Answers: A. d), B. c)

Source: Alien Forest Pests, pg 4

Soils - 10 Points

A) Why is residue cover on the soil surface important? Give two reasons. (2 points)

Answer: Prevent wind and water erosion, maintain organic matter

Source: Best Management Practices – Soil Management p. 65.

- B) Would this site be suitable for a sanitary landfill? Why or why not? Provide 2 reasons to support you answer. (3 points)

Answer: No. This area is an old oxbow. Site is in flood zone, soil texture is not high enough in clay. Proximity to river.

Source: Interpretation of site

- C) When should a producer base manure application rates on P₂O₅ rather than nitrogen? (1 point)

Answer: When P₂O₅ application exceeds 250%

Source: A Working Guide to Manure Management Planning

- D) The risks of livestock operations on potable groundwater supplies can be minimized by what two ways? (2 points)

Answer:

- *Locating manure structures, outdoor pens and field manure storage in areas underlain by thick clay materials*
- *Minimizing the duration of field manure storage before spreading*
- *Applying manure at proper agronomic rates as a fertilizer with due consideration for crop requirements, soil texture and sensitivity of underlying aquifers.*

Source: Livestock Operations and Groundwater Quality

- E) Indicate which of the following statements related to the application of manure is correct. (1 point) Circle
- A Manure provides all of the nutrients required to support crop growth in an ideal ratio
 - B All of the nutrients contained in manure are immediately available for crop uptake
 - C Nutrients from manure are subject to losses
 - D Manure is less effective for restoring productivity on saline soil than is commercial fertilizer.

Answer: C – *Nutrients from manure are subject to losses.*

Source: A Working Guide to Manure Management Planning

- F) The CEC of a soil provides indication of: (1 point) Circle
- A the soil's ability to store nitrate nitrogen against leaching losses
 - B the ability of the soil to store anions
 - C the water holding capacity of the soil
 - D the degree of soil acidity

Answer: B – *the ability of the soil to store anions*

Source: Soils '84 pp. 10-11.

Wildlife - 2 Points (1 each)

A) What is Chronic Wasting Disease?

B) What wildlife is affected by CWD?

Answers:

A) It is a fatal neurologic disease, Transmissible spongiform encephalopathies.

B) Manitoba's deer and elk populations.

Reference: Chronic Wasting Disease brochure