

2000 Trail # 1
Stop # (1)
WETLANDS (Forests, Soils, Wildlife, Aquatics)

Courtyard

WETLANDS (12 marks in total)

Part A (3 marks):

Hands-on

Using the equipment provided conduct the following tests on your water sample from the marsh:

- pH
- O₂
- Temperature

Record the value from each test.

Equipment provided: Wetland Ecology kits for pH, oxygen meter, thermometer, disposal jars and instruction sheets.

Answer: as tested, will provide a range of acceptable answers

Source: everything provided

Part B (1 mark):

Is this pH level within the safe range for most aquatic organisms?

Theory

Answer: Yes, aquatic organisms need a pH range between 5 and 9.

Source: Wetlands binder – Water quality testing.

Part C (1 mark):

Theory

Oak Hammock Marsh is...

- a) oligotrophic
- b) mesotrophic
- c) eutrophic

Answer: c) eutrophic

Source: page 110 of Aquatics Binder

Part D (1 mark):

Theory

Knowing the answer to Part C, which of the following is most likely false? Circle your answer(s).

- a) total dissolved solids are high
- b) pH is high
- c) high species diversity exists
- d) a highly stable environment exists

Answer: c) and d)

Source: page 110 of Aquatics Binder

Part E (6 marks):

Theory

True or False

- a) You would expect a "rotten egg smell" when the redox potential is negative. (_____)
- b) Methane is the "rotten egg gas". (_____)
- c) Algae are considered vascular plants. (_____)
- d) Algae that makes rocks slippery is called epiphyton. (_____)
- e) Phytoplankton relies on nutrients available in the water column. (_____)
- f) Aerenchyma is spongy tissue that carries air to the roots of some macrophytes. (_____)

Answer:

- a) *true, a negative redox is an indicator of anaerobic conditions*
- b) *false, hydrogen sulphide is "rotten egg gas"*
- c) *false, vascular plants have xylem and phloem, algae does not*
- d) *false, epiphyton grows on plants, epilithon grows on rocks*

- e) true, phytoplankton gets its nutrients from the water column
- f) true, aerenchyma makes the stems of plants like cattail feel spongy

Source: Delta workshop

Forests (2 marks)

Theory

In your own words define the term “value-added manufacturing” as it pertains to wood products and its’ significance in the provincial economy.

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

Soils (2 marks)

Theory

List three factors that affect the rate of decomposition of organic matter.

Answer: pH, aeration, temperature, moisture, and type of vegetation

Source: BMP Soil Management page 13

Wildlife (2 marks)

Theory

Why does deep water benefit diving ducks more than dabbling ducks? Circle the correct answer(s).

- a. It provides habitat for bottom dwelling insects.
- b. It allows for easier take-off and landings.
- c. It provides habitat for increased growth of Potomageton.
- d. It provides denser nesting cover.

Answer: a), b), and c)

Source: Marsh World

Aquatics (2 marks in total)

Part A (1 mark):

Theory

Assume that during the fall overturn period in one of our deep lakes measurements of the following four water parameters were taken at depth intervals of 0.3 meters and that the four sets of results were plotted with the parameters along the “x” axis and depth along the “y” axis. If for each set of results the points were connected, which of the plots would not approximate a straight vertical line?

- a) temperature
- b) density
- c) oxygen concentration
- d) pH
- e) none of the above
- f) all of the above

Answer: None of them.

Source: Aquatics binder page 12

Part B (1 mark):

Theory

Which of the following four physical processes results in a decrease of the oxygen concentration in the water of a pond or river?

- a) diffusion
- b) respiration
- c) aeration
- d) photosynthesis

Answer: b) respiration

Source: Aquatics binder page 19

Trail # 1
Stop # (2)
WETLANDS (Forests, Soils, Wildlife, Aquatics)

Floating Boardwalk

WETLANDS (12 marks in total)

Part A (6 marks): Hands-on
 Using the equipment and identification sheets provided identify as many aquatic invertebrates as possible. For each species, describe its feeding habit.

Species Name	Herbivore, Carnivore, or Omnivore?

Equipment provided: pre-collected invertebrates, identification sheets.
Answer: students should be able to identify at least 6 species. Half marks for naming the species and half marks for its feeding habit. Description of each feeding habit can be found in Aquatics binder – Structure of an Ecosystem.
Source: everything is provided, field training

Part B (1 mark): Theory
 Bloodworms get their common name from their bright red colour. The red comes from extra haemoglobin carried on the red blood cell of this animal. What does this tell you about its habitat? That it is:

- a. pelagic
- b. anaerobic
- c. oligotrophic
- d. autotrophic.

Answer: b) anaerobic
Source: page 115 of Aquatics Binder

Part C (1 mark): Theory
 A bloodworm feeding on decaying organic matter at the bottom of Oak Hammock marsh best describes its:

- a. habitat
- b. symbiotic relationship
- c. niche
- d. all of the above

Answer: c) niche
Source: page 87 of Aquatics Binder

Part D (2 marks): Theory
 List two roles that chironomids play in the food web of Oak Hammock Marsh.
Answer: Two of three key points relate to their roles in: nutrient cycling, as a food source in the food chain, and as a grazer. Chironomids develop in bottom sediment and emerge as adults from the water. They disturb the sediments and, in so doing, stimulate nutrient release to the overlying water.

As larvae, chironomids are important food for aquatic animals. As adults, chironomids are food for birds. Chironomids are important grazers on wetland algae, regulating its abundance.

Source: Delta workshop

Part E (2 marks):

Theory

List two roles that fungi play in the food web of Oak Hammock Marsh.

Answer: Two key points relate to their roles in decomposition and as a food source. Fungi are important decomposers of live and dead organic matter in wetlands, in the form of plants and animals. Their tissue is also a nutritious food source for wetland invertebrates, some fish, and other vertebrates.

Source: page 89 of Aquatics Binder

Forests (2 marks)

Theory

True or False

- a) The amount of carbon stored by wetlands is comparable to that stored by forests. (_____)
- b) Bogs, fens, and swamps are all peat-forming wetlands. (_____)
- c) An arbovirus is a virus that is spread by trees. (_____)
- d) A hemi-marsh is a wetland that is half cattails and half trees. (_____)

Answer: a) true, b) false, swamps are not peat-forming, c) false, an arbovirus is an arthropod-borne virus, d) false, a hemi-wetland is a wetland that is half open water and half emergent vegetation

Source: Delta workshop

Soils (2 marks)

Theory

Foul smelling "swamp gases" are released when wetland soils are disturbed. Why are they formed?

Name two of these swamp gases.

Answer: They are the products of anaerobic decomposition in the soil. Hydrogen sulphide smells like rotten eggs and methane smells like ammonia.

Source: Delta workshop

Wildlife (2 marks)

Theory

Circle the two most common minnows in prairie marshes.

- a) fathead minnow
- b) carp
- c) perch
- d) brook stickleback
- e) chub
- f) shiner

Answer: a) and d)

Source: Delta workshop

Aquatics (2 marks)

Theory

You arrive at Oak Hammock Marsh towards the end of March. Although there is still 600mm (24 inches) of snow on the ground, the weather has been warm and the ice has melted away from the shoreline. The water smells of rotten eggs and there are dead fish in the water. What has happened?

Answer: Winterkill. Deep snow limited sunlight from penetrating the ice. With no sunlight, photosynthesis could not occur to produce oxygen. Decomposing organic matter on the bottom of the marsh used up all of the available oxygen and the marsh became anaerobic - resulting in dead fish and methane gas.

Source: Delta workshop

Trail # 1

Stop # (3)

WETLANDS (Forests, Soils, Wildlife, Aquatics)

Muskrat Trail at cattail stand

WETLANDS (12 marks in total)

Part A (3 marks):

Hands-on

Identify the dominant wetland plant at this location. Describe how it helps clean polluted water. Explain why it usually does not grow in water over 1 metre deep.

Equipment provided: Marsh World, interpretive sign on cattails

Answer: Cattails. They clean water by removing excess nitrogen and phosphorus, heavy metals, harmful bacteria and other chemicals and slowing water down to help sediments settle out. Cattails are limited by their ability to transport oxygen from the atmosphere down through tissues of the stem into the roots, which must be kept supplied. Otherwise, the roots quickly become anaerobic and die. To a lesser extent, the water depth also affects the amount of light that the plant receives, but it is usually ability to get oxygen into roots that regulates the varying depth "preference" of wetland plant species.

Source: Marsh World, Delta workshop, interpretive sign, and binder – Nature notes Cattail marshes – Nature's cleansers.

Part B (3 marks):

Hands-on

Identify this duck. Is it a dabbler or a diver? What are the characteristics of this group?

Equipment provided: Field guide, interpretive sign of dabbler and divers, mount.

Answer: Northern Pintail – a dabbler. Dabblers are ducks whose legs are set midway under their bodies. They tip up to eat and when taking flight they seem to leap out of the water.

Source: Marsh World

Part C (6 marks):

Theory

Describe the natural "Wet-Dry Cycle" of a prairie marsh using the terms: lake marsh, degenerating marsh, dry marsh, and regenerating marsh. Begin with the dry cycle. Explain how wetland managers use "drawdown" to create a "hemi-marsh."

Answer: During the dry cycle, the soil surface is exposed to the sun and plant seeds begin to germinate from the mud (dry marsh stage). The plants gradually grow and spread to fill the mudflats with dense stands of emergent plants. When the water returns during the wet part of the cycle, the plant stems are flooded (regenerating marsh stage). In some areas the water is so deep that the emergent plants begin to die (degenerating marsh stage). During this stage, muskrats also feed on the emergent plants creating large openings. Eventually the open water areas dominate the marsh (lake marsh stage). During the next drought period, they cycle begins again. When a marsh is in the lake marsh stage, wetland managers will force a wetland into the "dry marsh" stage by artificially draining the wetland. The goal is to encourage the growth of emergent plants, and to re-flood the wetland to create a hemi-marsh (half cattail, half open water) – as this is the most productive stage for most wetland wildlife.

Source: Delta workshop

Forests (2 marks)

Theory

There are two types of wetland that support trees. Name two species of trees that you would expect to find in these wetlands.

Answer: black spruce, tamarack, cedar, some specialised hardwoods

Source: Wetlands binder, Why Wetlands? Education kit, page 21

Soils (2 marks in total)

Part A (1 mark):

Theory

Symbiotic nitrogen fixation is the process in which atmospheric nitrogen is converted to ammonia in

the root nodules of (_____).

- a) legumes
- b) grasses
- c) lichens
- d) fungi

Answer: a)

Source: Soils binder, The Living Soil page 44

Part B (1 mark):

Theory

In terms of boosting yields, the most important nutrient applied as fertiliser in Western Canada is:

- a) potassium
- b) nitrogen
- c) phosphorus
- d) copper

Answer: b)

Source: page 44 in Soil a Renewable Resource

Wildlife (2 marks)

Part A (1 mark):

Theory

Why is it important to draw down water levels? Circle the correct answer(s).

- a. It provides an opportunity for seeds to germinate.
- b. It allows for plant material to rot and recycle through the system.
- c. It fosters the re-establishment of emergent plant species and their associated fauna.
- d. It will provide habitat for shorebirds.

Answer: all

Source: Wetlands binder, Ducks Unlimited Canada reprint -- Drawdown

Part B (1 mark):

Theory

What group(s) of birds will not benefit from a drawdown?

- a. Canada Geese and Snow Geese
- b. Shorebirds
- c. Rails
- d. Coots

Answer: a)

Source: Wetlands binder, Ducks Unlimited Canada reprint -- Drawdown

Aquatics (2 marks)

Theory

List two factors that determine the amount of sunlight that reaches the bottom sediments in a wetland such as Oak Hammock Marsh.

Answer: Any two of the following: a) season, b) time of day, c) cloud cover, d) density of emergent plants, e) density of submersed plants, f) water depth, g) turbidity of water column, h) water chemistry (e.g., level of colour substances such as dissolved organic carbon)

Source: Delta Workshop

Trail # 1

Stop # (_4_)

AQUATICS (Wetlands, Forests, Soils, Wildlife)

Along trail at a muskrat lodge

AQUATICS (12 marks)

During the agricultural development of this area the landscape west of Oak Hammock Marsh was drained via Wavey Creek drain around the north end of the marsh. Shortly after beginning to manage the marsh, managers realised that there was a lack of water to maintain the cells full. In 1983 at a cost of approximately one million dollars, a control structure with two radial gates was built on Wavey Creek and a supply channel was excavated to the marsh. See the photograph of the structure dated November 5, 1999. When the gates are closed, runoff from the upstream portion of Wavey Creek is diverted east to the marsh via the supply channel. See map 29 of WAVEY CREEK AND ADJACENT WATERSHEDS.

Determine what percentage of Oak Hammock Marsh could be filled by an average yearly runoff diverted from Wavey Creek by this control structure?

Given that:

- Oak Hammock Marsh total area is 20 square kilometres
- Oak Hammock Marsh average depth is 0.6 meters.
- Watershed map #29 shows the Wavey Creek control structure drainage area (outlined in pink), the supply channel (highlighted in green) and Oak Hammock Marsh (highlighted in blue).
- One square mile equals 2.59 square kilometres.
- 20 millimetres of water are, on average, shed each year from the Wavey Creek watershed.

Answer:

Drainage Area

$$= 92 \text{ Sq. Mi.}$$

Average runoff volume

$$= 92 \text{ Sq. Mi.} \times 2.59 \text{ Sq. Km.} / \text{Sq. Mi.} \times 1,000,000 \text{ Sq. M.} / \text{Sq. Km.} \times 0.02 \text{ M.}$$
$$= 4,765,600 \text{ Cu. M.}$$

Marsh volume

$$= 20 \text{ Sq. Km.} \times 1,000,000 \text{ Sq. M.} / \text{Sq. Km.} \times 0.6 \text{ M.}$$
$$= 12,000,000 \text{ Cu.M.}$$

Percentage

$$= 4,765,600 / 12,000,000 \times 100 = 40\%$$

Source: High school curriculum and field training

Wetlands (2 marks)

Site specific

List an advantage and a disadvantage of muskrats to a marsh.

Answer: Advantages: Muskrats eat cattails and are an important part of the food chain.

Disadvantages: Muskrats may over-eat cattails and burrow into dikes causing them to collapse.

Source: Hinterland Who's who for both beaver and muskrat in the binder, also the interpretive sign

Forests (2 marks)

Theory

Rationalise “clear cutting” as a silviculture management tool.

Answer: Can be applied to even-aged, sun tolerant tree species such as jack pine. In the case of jack pine, cones left on the harvest site are exposed to the sun’s heat, which opens the cones releasing the seed. The seed falls on exposed mineral soil, a suitable medium for germination and a new forest is born.

Source: Forestry binder, Tomorrow’s Forests ... Today’s Challenge, Teacher Information Kit 85, page 6 and 15.

Soils (2 marks)

Theory

In some areas of Manitoba, drainage is the major limiting factor to crop production. Many areas have had drainage improved since early settlement. List two environmental concerns associated with improved land drainage in Manitoba.

Answer: Flooding, loss of habitat, effect on groundwater levels, water quality.

Source: Wetlands binder – Wetlands and their values

Wildlife (2 marks)

Theory

How do muskrat populations change the open water areas in marshes? Why?

- a) Increase open water
- b) decrease open water
- c) do not change open water

Answer: a) increase. They eat vegetation creating areas of open water.

Source: Hinterland Who’s Who -- Muskrat

Trail # 1

Stop # (5)

Near ground squirrels and Phragmites or cattail

WILDLIFE (Aquatics, Wetlands, Forests, Soils)

WILDLIFE (12 marks in total)

Part A (3 marks):

Theory

Match the wildlife species to the area of home range required (in hectares) for each species.

gray wolf pack	377 000
deer mouse	153 000
porcupine	943
elk	34.9
chickadee	.54
grizzly bear	.06

Answer:

<i>gray wolf pack</i>	<i>153 000</i>
<i>deer mouse</i>	<i>.06</i>
<i>porcupine</i>	<i>34.9</i>
<i>elk</i>	<i>943</i>
<i>chickadee</i>	<i>.54</i>
<i>grizzly bear</i>	<i>377 00</i>

Source: Forest Wildlife PG 7, wildlife binder

Part B (2 marks):

Theory

True or False

- a) Before 1880, white-tailed deer were uncommon in Manitoba. (____)
- b) The population of moose in Manitoba has increased since European settlement. (____)
- c) Raccoons were rare in Manitoba prior to 1950. (____)
- d) Gray Squirrels moved into Manitoba in the last 100 years. (____)

Answer:

- a) true*
- b) false*
- c) true*
- d) true*

Source: Status and History of Wildlife, Wildlife Binder

Part C (1 mark):

Theory

What is making this sound?

Answer: Boreal Chorus Frog

Source: Bill will play tape of frog at morning info time.

Part D (1 mark):

Theory

What is making this sound?

Answer: Great Gray Owl

Source: Bill will play tape of owls at morning info time.

Part E (1 mark):

Theory

Why is wildlife and wildlife habitat important to the developments of new drugs and treatments in the medical field?

Answer: Most drugs were discovered or developed by studying wild species, not invented on the basis of chemistry.

Source: PG 4 *The benefits of wildlife pamphlet, wildlife binder*

Part F (1 mark):

Theory

What kind of animal is this skeleton from?

Answer: *frog (from Oak Hammock lab)*

Source: *should be able to figure is out*

Part G (3 marks):

Theory

Name three reasons wetlands are important?

Answer: *Any three of: they provide wildlife habitat, control flooding and erosion, protect surface and ground water quality, form links between uplands, lakes and streams*

Source: PG 10 "*Forest Wildlife*" section, *wildlife binder*

Aquatics (2 marks)

Theory

It is estimated that evaporation on Oak Hammock Marsh from May to October inclusive lowers water levels on average by 4.5 decimetres. Given that the surface area of the marsh is approximately 20 square kilometres, what is the volume of this evaporation in cubic meters?

Answer: *9,000,000 Cu. M.*

0.45 M. x 20 Sq. Km. x 1,000,000 Sq. M. / Sq. Km.

Source: *Grade 12 curriculum*

Wetlands (2 marks)

Hands-on

Using the sheets provided identify this marsh plant. Why is it called an "emergent"?

Equipment provided: *Wetland Ecology plant sheets, marker for plant, pressed plant of same species.*

Answer: *bulrush*

Source: *Wetlands binder – Urban Outback definitions, Wetland ecology identification sheets, field guide, Marsh World*

Forests (2 marks)

Theory

Define reforestation and regeneration.

Answer: *Reforestation is the replanting of trees in forests that have been affected by cutting, disease, or other incursion. Regeneration is the renewal of a tree crop whether by natural or artificial means. The regeneration period is the period required or allowed in the plan for regenerating following timber harvest.*

Source: *Forestry binder glossary*

Soils (2 marks)

Theory

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

Answer: *Calcium and Magnesium*

Source: *Soils 84, page 8*

Trail # 1

Stop # (_6_)

Willow Bluff near beaver lodge

FORESTS (Soils, Wildlife, Aquatics, Wetlands)

FORESTS (11 marks in total)

Theory

Part A (4 marks):

Theory

Explain why research and technology developments are important in forest management and forest products manufacturing. Provide examples of each.

Answer: Research in forest management increases the knowledge of biological processes thus improving our abilities to manage natural resources (e.g. understanding of interaction of organisms). Research of chemical and physical properties of wood helps to find new applications for wood products (e.g. development of new and improved products and processes).

Source: Forestry binder, Manitoba Forests, page 7

Part B (2 marks):

Theory

Discuss one plant species' adaptation to fire.

Answer: Trembling aspen have the ability to sucker from roots, however, chemicals produced in standing trees suppress root suckering until a fire removes it. Spruce trees and jack pines open up their cones in fires to release seeds. Oaks have fire-resisting bark.

Source: Forestry binder, Tomorrow's Forests ... Today's Challenge page 10

Part C (2 marks):

Theory

Describe two ways in which fire improves area food resources for ground dwelling animals?

Answer: It brings the terminal down to where it can be used. It stimulates growth as shade is reduced. Nutrients are available that were tied up in fibre. Pioneer plants species invade (seed producers).

Source: ?

Part D (1 mark):

Theory

The trees and woody shrubs are deciduous plants. What does that mean?

Answer: they shed their leaves in the fall

Source: Forestry binder, glossary

Part E (1 mark):

Theory

What type of wetland (in the Canadian Wetland Classification System) provides trees for the softwood industry? What softwood tree(s) grow in this type of wetland?

Answer: Bogs. Black Spruce.

Source: Wetlands binder Four types of wetlands, Why Wetlands? Education kit, page 21 and Forestry binder Manitoba's Forests page 2

Part F (1 mark):

Theory

Define employment multiplier.

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

Source: Forestry binder, Manitoba's Forests page 8

Soils (2 marks in total)

Theory

Part A (1 mark):

The Cation Exchange Capacity (CEC) of a soil provides an indication of:

- the soil's ability to store negatively charged particles.
- the degree of salinity of a soil.
- the soil's ability to store positively charged particles.
- the degree of soil acidity.

Answer: c)

Source: *Soils 84, page 7*

Part B (1 mark):

Theory

Which soil will warm up the fastest?

- a) Bare wet mineral soil
- b) Bare dry mineral soil
- c) Dry mineral soil with standing stubble
- d) Wet mineral soil with standing stubble

Answer: B

Source: *Soil Management, Best Management Practices, page 18*

Wildlife (2 marks)

Theory

Explain how Ducks Unlimited Canada uses beaver activity to help with wetland management.

Answer: Once the beaver pond has been abandoned, and the wetland begins to degenerate, the dam is removed so that trees can re-establish. Beaver will then return to the area and the process begins again. Through Beaver Pond Management, the natural cycle is accelerated to maximise the most productive periods of the cycle.

Source: Beaver Pond Management brochure and Delta workshop

Aquatics (2 marks)

Theory

Where in a wetland such as Oak Hammock Marsh would you expect to find the most minnows occurring during the night? Would you expect different results during the day? Why or why not?

Answer: Most minnows would probably occur in the open water at night where oxygen levels are highest, as compared to low levels that develop amongst emergent plants at that time. During the day, minnows would tend to move into emergent plant beds to graze on abundant invertebrate and algal food there; if there are fish-eating fish species present, they may also move there to escape being eaten.

Source: Aquatics binder page 60 -67

Wetlands (2 marks in total)

Part A (1 mark):

Theory

List the five basic types of wetlands found in Canada.

Answer: bog, fen, marsh, swamp, shallow open water

Source: Wetlands binder - The Canadian Wetland Classification System

Part B (1 mark):

Theory

Why are wetlands important?

Answer: should mention purifies water, provides habitat and for many species (plants, mammals, reptiles, amphibians, birds, fish, insects, etc.), decreases flooding by retaining water, recharges groundwater, and human enjoyment.

Source: Wetlands binder – Wetlands and water quality.

Trail # 1

Stop # (_7_)

Clubhouse (indoors, electricity)

SOILS (Wildlife, Aquatics, Wetlands, Forests)

SOILS (12 marks in total)

Hands-on

Part A (4 marks):

Using the pH meter, measure the pH of the slurry of the two soils provided. Which soil is more acidic (Soil A or Soil B)? Which soil would tend to have a higher amount of carbonates? What influence does pH have on soil? List 2 things.

Answer: Higher carbonates in high pH soil, Soil pH affects microorganisms and soil fertility.

Source: Soils 84, page 8

Part B (2 marks):

Hands-on

Using the container provided, weigh the soils marked A and B. The container should be filled and levelled. Based on the weights of A and B, which has the higher bulk density?

True or False

Clay has a higher bulk density than sand. (_____)

Answer: A, False

Source: page 12, BMP Soil Management, deduction

Part C (2 marks):

Hands-on

Using the soil sample provided.

1. Measure the depth of the A horizon.
2. What is the depth to the parent material (C horizon)?

Answer: 1. 22-26 cms, 2. 35-41 cms, the depths will be as measured.

Source: field training, observation

Part D (3 marks):

Hands-on

Compare the two Soil Profiles provided (A & B). Based on your observations, which soil has better drainage? Why? Which of these soil profiles would most likely occur near Oak Hammock Marsh?

Answer: Soil A (Almasippi) is better drained, Soil B (organic)

Source: Soils binder, BMP Soil Management, page 16, 17 and observation

Part E (1 mark):

Theory

Silt as defined by particle size analysis has the following dimensions:

- a) Greater than 2 mm
- b) 2 – 0.05 mm
- c) 0.05 – 0.002 mm
- d) Less than 0.002 mm

Answer: C

Source: Soils 84, page 4

Wildlife (2 marks)

Theory

Raising the water levels in the cell circled on the air photo will reduce plant diversity, increase open water areas and reduce cover. Why is this desired? Circle the correct answer(s).

- a. It will allow nutrients to decay and sink to the bottom.
- b. It will break up vegetation mats.
- c. It will provide more nesting cover.

Equipment provided: air photo mosaic with a circle around a cell with dense emergent growth.

Answer: a) and b)

Source: *Delta Workshop and Wetlands binder, Ducks Unlimited Canada reprint -- Drawdown*

Aquatics (2 marks in total)

Hands-on

Part A (1 mark):

What is the name of this dark band?

Answer: annuli

Source: field training

Part B (1 mark):

Using the microscope, determine the age of the fish this otolith came from.

Answer: 16 plus or minus one (i.e. 15 or 17)

Source: field training

Wetlands (2 marks)

Theory

Name two features that characterise all wetlands?

Answer: Two of the following:

- a) *presence of water, either at the surface (< 2 m depth) or in the root zone, so soil is saturated at some time during the growing season*
- b) *unique hydric soil conditions, different from adjacent uplands, that are associated with reducing (anaerobic) condition*
- c) *vegetation with morphological, physiological and productive adaptations to the above conditions*

Source: Delta workshop, Wetlands binder

Forests (2 marks)

Theory

Explain the phrase “the task is to balance the need to exploit forests against the need to preserve them”.

Answer: Sustainable forest management maintains and enhances the long-term health of forest ecosystems for the benefit of all living things, while providing ecological, economic, social and cultural opportunities for present and future generations.

Source: The Biodiversity Challenge, page 1

AQUATICS (12 marks)

Part A (1 mark):

Theory

What type of underground formation allows for these springs to form?

- a. Water passing through gravel sediments left by Lake Agassiz rise to the surface here.
- b. Limestone bedrock layers slant slightly downward to the east; breaks in these layers allow for water to rise to the surface.
- c. Underground water reservoirs have gently sloping bedrock bottoms that trap water. These artesian wells allow this water to escape to the surface.

Answer: b)

Source: on-site sign

Part B (8 marks):

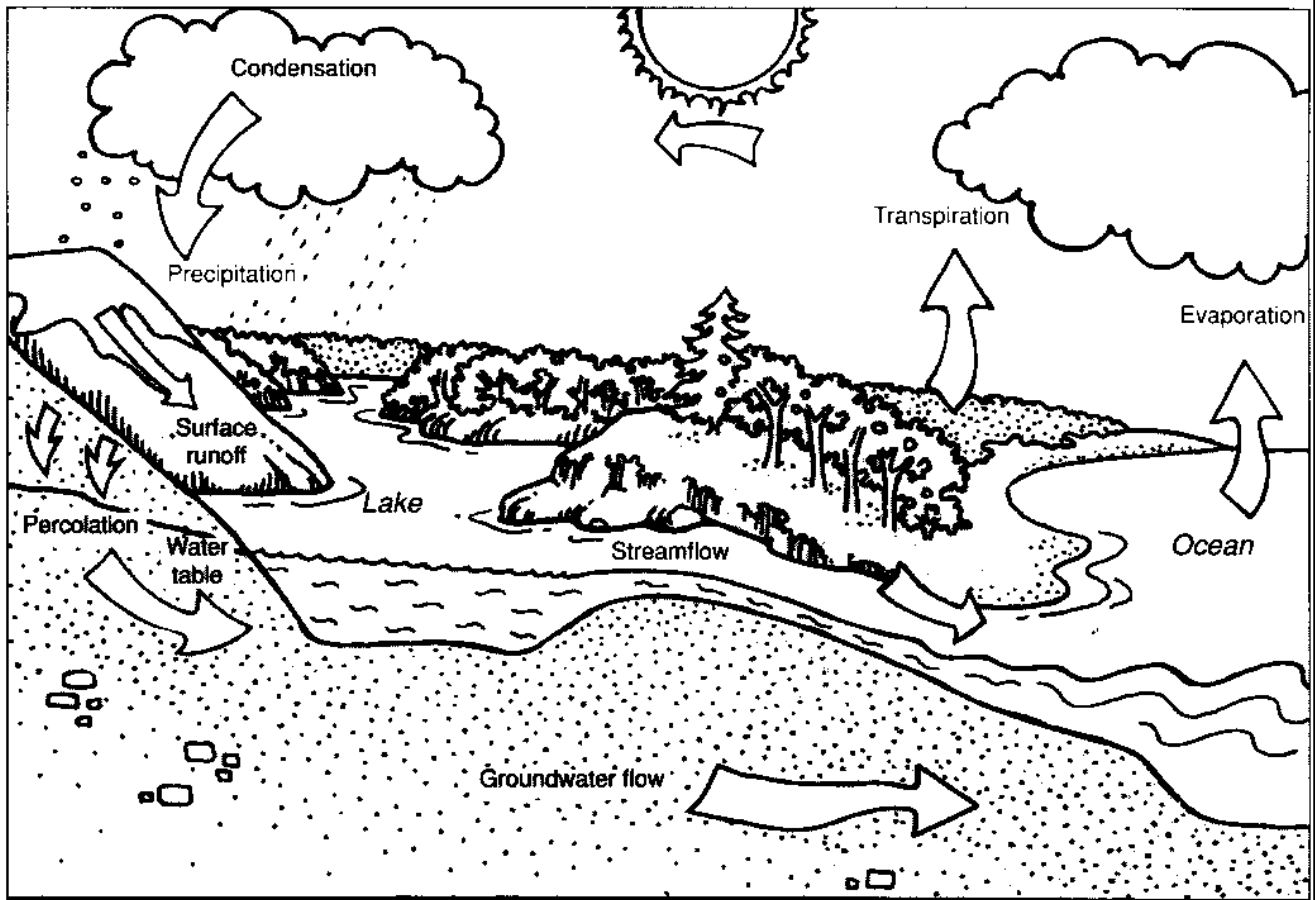
Theory

Draw and label 8 components of the hydrological cycle.

Answer: Should include evaporation, transpiration, condensation, precipitation, surface runoff, percolation, groundwater and water table.

Figure 1

The hydrologic cycle



Part C (3 marks): Theory
List three physical adaptations of the stonefly to fast flowing cobble bottomed streams.
Answer: streamlined body, muscular legs and claws on feet
Source: Aquatic binder, page 52-53

Wetlands (2 marks in total) Hands-on
Part A (1 mark):
Name this grass.
Equipment provided: plant keys, reference books, and perhaps dried specimens
Answer: Big bluestem
Source: Wetland ecology identification sheets, field guide

Part B (1 mark): Hands-on
Name this wildflower.
Equipment provided: plant keys, reference books, and perhaps dried specimens
Answer: Purple prairie clover
Source: Wetland ecology identification sheets, field guide

Forests (2 marks) Theory
Development of a forest from a dry, bare rock environment is a form of (____) (____). Be specific.
Answer: Xeric (1 mark) Succession (1 mark)
Source: Bollman - From Rock to Tree, p.1

Soils (2 marks) Theory
What two things should be considered when converting farmland to urban areas?
Answer: the value of loss of agriculture production, environmental impacts to wildlife, habitat, water, need for expansion of the city, requirements for space whether there are other options
Source: Land Use and Society

Wildlife (2 marks) Theory
The three plants listed as endangered by the Manitoba Conservation Data Centre occur on tall-grass prairie. Name them.
Answer: Great Plains ladies'-tresses, small white lady's-slipper, western prairie fringed orchid
Source: wildlife binder - MBDCDC Species at risk pages Source: The Biodiversity Challenge, page 1

Trail # 2

Stop # (2)

At concrete pad

WETLANDS (Forests, Soils, Aquatics, Wildlife)

WETLANDS (11 marks in total)

Hands-on

Part A (3 marks):

Using the equipment provided conduct the following tests on your water sample from the artesian spring.

- pH
- O₂
- Temperature

Equipment provided: Wetland Ecology kits for pH, oxygen meter, thermometer, disposal jars and instruction sheets.

Answer: will provide a range of results

Source: field test and instructions at site

Part B (1 mark):

Theory

Is the O₂ level within the safe range for most aquatic organisms?

Answer: Yes, aquatic organisms need an oxygen range between 6 and 14 ppm.

Source: Wetlands binder – Water quality testing.

Part C (2 marks):

Theory

Circle the characteristic(s) shared by wetland fish.

- a) avoidance of areas with low dissolved oxygen
- b) high activity
- c) ability to rapidly re-colonise after local extinction

Answer: a) and c)

Source: Delta workshop

Part D: (1 mark):

Theory

How much of the original Tall-Grass Prairie is left in Manitoba?

Answer: Less than 1%.

Source: Wildlife binder, Manitoba's tall-grass prairie preserve pamphlet

Part E (2 marks):

Hands-on

Identify the species of bird in the picture. What is special about its flight?

Equipment: Field guide, picture of a harrier.

Answer: Northern Harrier. It holds its wings up above the horizontal (looks v-shaped).

Source: field guide

Part F (2 marks):

Theory

True or False

The Prairie CARE program

- a) Gives farmers technical support to help them implement practices that benefit both the soil and wildlife. (_____)
- b) Promotes chemical fallow over plowing. (_____)
- c) Promotes zero-tillage (seeding crops directly into stubble) to keep cover on land for nesting birds and reduce soil erosion. (_____)
- d) Promotes rotational grazing to keep cover on the land. (_____)

Answer:

- a) True

- b) True
- c) True
- d) True

Source: Ducks Unlimited Fact Sheet – Prairie CARE (Wetlands binder)

Forests (2 marks)

Theory

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

Answer: 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, Teacher Information Kit 85, page 14

Soils (2 marks in total)

Part A (1 mark):

Theory

Soil organic matter is important because it:

- a) assists in helping improve aeration and water movement.
- b) promotes good soil structure.
- c) provides cementing material for aggregate formation.
- d) all of the above.

Answer: d)

Source: Soil A Renewable Resource

Part B (1 mark):

Theory

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

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

Source: BMP Soil Management, page 16

Aquatics (2 marks in total)

Part A (1 mark):

Theory

Flowing artesian wells are located in what type of aquifer?

- a) confined aquifer
- b) unconfined aquifer
- c) porous media aquifer
- d) fractured aquifer

Answer: a) confined aquifer

Source: Aquatics binder, Freshwater Series A-3, page 5

Part B (1 mark):

Theory

Why are poikilotherms so sensitive to changes in water temperature?

Answer: Poikilotherms (fish) are "cold blooded" so their body temperature is the same as the surrounding environment. Their metabolic rate and oxygen demand is determined by water temperature.

Source: Aquatics binder, page 23

Wildlife (2 marks)

Theory

Identify this amphibian. At times, several frogs can be found floating motionless (as if dead) in the water of the artesian spring. Explain why this might happen.

Equipment provided: live frog if possible, replica if not. Guide to amphibians of Manitoba.

Answer: Wood Frog or Boreal Chorus Frog. Frogs will jump into the water when startled by people or a predator. Because they are poikilotherms and the water is only 4 degrees, they become virtually motionless until they warm up.

Source: deduction based on measurement of water temperature at this stop

Trail # 2
Stop # (3)
AQUATICS (Wetlands, Forests, Soils, Wildlife)

Bridge Site

AQUATICS (14-marks)

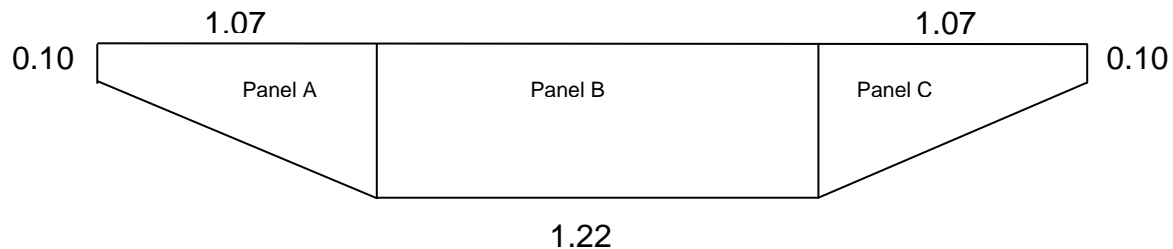
Hands-on

Part A (10 marks):

With the metering equipment and streamflow cross section information provided, determine the discharge in this stream. Measure the streamflow water velocities below the two indicated locations. Assume the velocity measured at location "B" to be representative of the average velocity for Panel "B" in the diagram of this streamflow cross-section provided below and the velocity measured at location "AC" to be representative of the average velocities for Panels "A" and "C". The streamflow dimensions associated with each of the panels is noted on the diagram. What is the discharge?

Streamflow Cross Section
Upstream View

Dimensions in meters



Answer: Approximately 0.25 cubic meters per second. The required theory ($Q=V \times A$) and equipment (Pygmy meter) operation knowledge (counting the clicks in the hydrophones over a 40 second period and using the provided chart to convert to velocity) will be presented in the morning field training session. Velocity will need to be determined at two locations, discharge determined for the three panels then added to determine the total discharge.

Source: Field training

Part B (4 marks):

Hands-on

This stream flows continuously into cell 2 of Oak Hammock Marsh with the discharge determined in Part A. See photograph at this site dated January 14, 2000. Cell 2 has an approximately surface area of 4 square kilometres and an approximate depth of 0.6 meters. How many days would it take this stream to fill cell2? Show your work.

Answer:

Daily runoff volume

$$= 0.25 \text{ Cu. M. / sec} \times 60 \text{ sec / min} \times 60 \text{ min / hour} \times 24 \text{ hours / day} = 21,600 \text{ Cu. M.}$$

Cell volume = 4 Sq. Km. x 1,000,000 Sq. M. / Sq. Km. x 0.6 M.
= 2,400,000 Cu. M.

Days to fill = 2,400,000 / 21,600 = 111 days

Source: Field training

Wetlands (3 marks)

Theory

Define an ecosystem.

Answer: Should include the 3 main concepts of interaction, groups of organisms, and living and non-living things.

Source: page 106

Forests (2 marks)

Theory

The relationship between jack pine roots and mycorrhizae is an example of:

- a) parasitism.
- b) commensalism.
- c) mutualism.
- d) symbolism.

Answer: c

Source: Bollman - From Rock to Tree, Aquatics binder page 94-95

Soils (2 marks)

Theory

List two practices farmers can use to reduce water erosion.

Answer: Zero-till, grassed waterways, forages, reduced summer fallow

Source: BMP, Soil Management, page 42

Wildlife (2 marks)

Theory

Name two ways prairie grasses are adapted to their environment?

Answer: Prairie grasses have extensive root systems for absorbing moisture and nutrients during periods of low moisture. Some grasses (cool season grasses) begin growth very early in the spring to take advantage of spring moisture and become dormant during the heat of the summer. Some grasses (warm season grasses) have adapted to hot summers and low moisture by changing the way they produce food in their leaves and stems. Some grasses are adapted to fire by having most of their biomass underground.

Source: Wildlife binder - Mixed-grass prairie pamphlet

Trail # 2

Stop # (_4_)

Near East interpretive sign

WILDLIFE (Aquatics, Wetlands, Forests, Soils)

WILDLIFE (12 marks in total)

Part A (5 marks):

Site specific, hands-on

Name the species of mammal that made its den in this location and list four reasons why this is a good site for the den.

Equipment provided: real den, rubber scats and tracks

Answer: Red fox (1). Any four of the following reasons. It is on a warm, south-facing slope. It is sheltered from the prevailing northwest wind. It is well-drained soil. It is near fresh water. There are plenty of mice, ground squirrels, insects, and songbirds for food.

Source: observation of size of the entrance and droppings, logic

Part B (1 mark):

Theory

Name another species that might also use this den.

Answer: skunk, garter snakes, badger

Source: general knowledge

Part C (3 marks):

Hands-on

Identify each skull as being from a herbivore or a carnivore.

Equipment provided: skulls, keys

Answer:

a) beaver – herbivore

b) wolf – carnivore

c) vole - herbivore

Source: materials provided

Part D (1 mark):

Hands-on

Dissect the owl pellet. What did the owl, that used this sign as a perch, have for dinner?

Equipment provided: owl pellets, bone sorting chart

Answer: Will be one of the following a rodent, a bird, or a shrew. Expert will be at site to initial test if it is correct.

Source: material provided

Part E (2 marks):

Theory

In what two ways is the Artesian spring important to early and late migratory birds?

Answer: Provides shelter, open water, and roosting areas.

Source: general knowledge, deduction

Aquatics (No question at this stop)

Theory

There are 2 extra marks at stop 6.

Wetlands (2 marks)

Theory

Explain how the following wetland animals use the upland habitats surrounding the marsh:

a) dabbling ducks

b) toads

c) short-eared owls and harriers

d) snapping turtles

Answer:

a) nesting (spring) and feeding on waste grain in fall

b) feeding and shelter

c) *nesting and feeding*

d) *laying eggs*

Source: *Marsh World and/or Pond Life*

Forests (2 marks)

Theory

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.

Source: Wildlife binder, glossary

Soils (2 marks)

Theory

Why are earthworms beneficial to soil? List 2 things.

Answer: Aerate the soil, provide nutrients, improve soil structure, breakdown organic matter, and improve water infiltration

Source: BMP, Soil Management, page 24

Trail # 2

Stop # (_5_)

Along the trail back

AQUATICS (Wetlands, Forests, Soils, Wildlife)

AQUATICS (10 points in total)

Theory

Part A (3 marks):

Theory

List 3 reasons why marsh habitat is important to fish species.

Answer: provides spawning habitat, provides nursery habitat and acts as a nutrient sink improving water quality for fish.

Source: field training

Part B (2 marks):

Theory

Draw a line from each fish structure to the most appropriate reference.

- | | |
|--------------|---|
| A. Scale | Used for aging sturgeon |
| B. Otolith | Least reliable for aging older fish |
| C. Cleithrum | Most reliable for aging older walleye and whitefish |
| D. Fin ray | Used for aging northern pike |

Answer: Scale – least reliable; otolith – most reliable; cleithrum - northern pike aging; fin ray – sturgeon aging

Source: Field Training

Part C (1 mark):

Theory

Of the 3 species of fish listed below which is the most difficult to age:

- a. Walleye
- b. Sturgeon
- c. Northern pike

Answer: c. northern pike

Source: field training

Part D (2 marks):

Theory

Why is it the most difficult to age?

Answer: They are difficult to age due to erratic growth rates and their soft bone structure, which results in the annuli formation that is often difficult to distinguish on aging structures.

Source: field training

Part E (2 marks):

Theory

Aging fish stocks in a waterbody allows fishery managers to determine two things. What are they?

Answer: 1) the number of year classes present and the relevant strength of each year class (% composition) and 2) the age and size of a fish species at maturity.

Source: field training

Wetlands (2 marks)

Which of the following could be considered an ecosystem? Circle your answer(s).

- a) decaying log in the forest
- b) Oak Hammock Marsh
- c) tall-grass prairie
- d) all of the above

Answer: All of the above

Source: Aquatics binder, page 104

Forests (2 marks)

Theory

List two components of a Model Forest.

Answer: Should include two of the following:

- 1. a diverse partnership of stakeholders and rights holders*
- 2. a large-scale working model of sustainable forest management*
- 3. site for developing and applying new knowledge and technologies*
- 4. a focus for promoting ecologically sound forest management practices*
- 5. a consensus-driven partnership working with shared decision-making to achieve social, environmental, and economic sustainability in forest management*
- 6. a creator of on-the-ground solutions addressing local needs and global concerns*
- 7. a place where communities and traditional knowledge play a role in forest management*
- 8. a link in a network to facilitate an exchange of ideas and approaches to sustainable forest management*

Source: Forestry binder, Canada's Model Forest Program

Soils (2 marks)

Theory

List two benefits of field shelterbelts.

Answer: Prevent wind erosion, protect crops, preserve moisture, provide habitat

Source: BMP page 58

Wildlife (2 marks)

Theory

Why has Tall-grass Prairie become an endangered habitat? Name the endangered bird that once made its home in the ground squirrel holes in the tall-grass prairie at Oak Hammock Marsh.

Answer: very fertile soil, cultivated. Burrowing Owl

Source: Wildlife binder - Tall-grass prairie preserve pamphlet

Trail # 2

Stop # (_6_)

Prairie north of spring

SOILS (Wildlife, Aquatics, Wetlands, Forests)

SOILS (12 marks in total)

Part A (1 mark):

Site specific

Based on your observations at this soil pit and knowledge of the area, what best describes how the soil was formed.

- a) bedrock deposits
- b) fluvial deposits
- c) aeolian deposits
- d) lacustrine

Answer: d)

Source: field training, Soils binder – Soil 84

Part B (1 mark):

Theory

Compared to the Grey-Wooded soils, Dark Brown soils:

- a) have a lower surface organic matter content
- b) have a shallower depth to the free lime layer
- c) are less prone to drought
- d) have a lower surface soil pH

Answer: a)

Source: page 22 in Soil a Renewable Resource

Part C (1 mark):

Would you find Dark Brown Soils in Manitoba?

Answer: No

Source: Living Soil, page 23

Part D (1 mark):

Theory

In the grassland region, typically the surface soils located in lower slope positions tend to:

- a) contain higher levels of organic matter
- b) contain lower levels of organic matter
- c) exhibit a lesser depth of soil development
- d) exhibit a shallower A horizon

Answer: a)

Source: page 22 in Soil a Renewable Resource

Part E (3 marks):

Theory

Give two examples of physical weathering and one example of chemical weathering.

Answer: Physical - freezing thawing, heating, wind, water, rooting

Chemical - reactions of acids in water, organic matter in the soil, oxidation

Source: page 9 in Soil a Renewable Resource

Part F (1 mark):

Theory

In a compacted soil

- a) nutrients are more available.
- b) water is more available.
- c) bulk density is increased.
- d) infiltration is improved.

Answer: c)

Source: Soils binder, Soil Management, Best Management Practices, pages 12, 34-36

Part G (2 marks):

Hands-on

Using the hand-texturing guide, determine the texture of the soil provided.

Answer: sandy loam

Source: Soils binder, field training

Part H (2 marks):

Theory

What are the four components that make up a soil?

Answer: Mineral, organic matter, air, water

Source: Soils binder, Soil: A renewable resource

Wildlife (2 marks)

Theory

Is fire beneficial to tall-grasses prairie? Why or why not?

Answer: Yes, breaks down dead and decaying vegetation and returns nutrients to the soil, gives the sun an opportunity to warm the soil earlier in the spring and slows the growth of invading trees and shrubs

Source: Wildlife binder - Tall-grass prairie preserve pamphlet

Aquatics (4 marks)

Theory

Write the word equation for alkalinity and show how the carbon atoms from carbon dioxide are incorporated in the food chain of northern pike.

Answer: Carbon Dioxide + Water \leftrightarrow Carbonic Acid \leftrightarrow Bicarbonate and carbonate (alkalinity)



Source: Aquatics binder, page 32-33

Wetlands (2 marks)

Theory

What is the primary threat to wetlands? Name one additional threat.

Answer: Drainage of wetlands for a variety of reasons, urbanisation, and agriculture being two of the most common. Additional threats include: pollution, introduced species, vegetation removal for recreation, global warming, etc.

Source: Wetlands binder - Why Wetlands? Education kit – Lesson 15 Threats to Wetlands.

Forests (2 marks in total)

Site specific

Part A (1 mark):

What natural factors prevented trees from encroaching on this tall-grass prairie site in the past?

Answer: fire, excess moisture (flooding)

Source: Wildlife binder, Manitoba's tall-grass prairie preserve pamphlet

Part B (1 mark):

Theory

What management tool is used today to prevent the establishment of shrubs and trees on the prairie sites at Oak Hammock Marsh?

Answer: prescribed burns or controlled burns

Source: Wildlife binder, Manitoba's tall-grass prairie preserve pamphlet

Trail # 2

Stop # (7)

Agricultural site

SOILS (Wildlife, Aquatics, Wetlands, Forests)

SOILS (12 marks in total)

Part A (1 mark):

Hands-on

Using the Land Classification for Agriculture, what is the Class of soil at SE 32-15-01E1?

- a) Class 1
- b) Class 4
- c) Class 5
- d) Class 6
- e) Class 7

Answer: c) Class 5

Source: Canada Land Inventory map at site, field training

Part B (1 mark):

Hands-on

This land location (SE 32-15-01E1) would be best suited for:

- a) annual crops
- b) enhancing wildlife
- c) location of town
- d) irrigation

Answer: b) enhancing wildlife

Source: training session, general knowledge

Part C (2 marks):

Theory

Using the Soil Texture Triangle, what is the textural name for a soil that has 65% Sand, 30% Clay

- a) Silty clay loam
- b) Silt Loam
- c) Sandy Clay Loam
- d) Loamy Sand

Equipment provided: Soil Texture Triangle

Answer: c)

Source: Soil and Plant Ecology, page 12 and BMP- Soil Management, Page 8

Part E (2 marks):

Theory

What are the two benefits associated with zero tillage?

Answer: Reduced erosion, reduced fossil fuels, and improved soil moisture

Source: page 52, Land Use and Society

Part F (1 mark):

Theory

With regard to 'green manuring', which one of the following statements is incorrect for the Canadian Prairies?

- a) It can help to improve soil physical properties.
- b) It can help to take up surplus nutrients that are vulnerable to losses.
- c) It reduces the amount of organic matter in the soil.
- d) All green manure crops improve the soil N status for the following crop.

Answer: c)

Source: Soils binder, A renewable resource

Part G (1 mark):

Theory

In order to increase soil organic matter levels, which of the following must be markedly reduced or eliminated?

- a) fertilisation
- b) use of legumes
- c) weed control
- d) tillage

Answer: d)

Source: *Soil & Plant Ecology*, p. 16

Part H (1 mark):

Theory

What is soil salinity?

Answer: *Buildup of soluble salts in the soil. High concentrations, reduce the plant's ability to take up water and it becomes toxic.*

Source: *Soils binder, The living soil, What is soil?*

Part I (1 mark):

Theory

Which one of the following soil components has the greatest effect on absorption of herbicides to soil?

- a) organic matter
- b) clay content
- c) microbial population
- d) sand content

Answer: a)

Source: *Soils binder, Soil Management, Best Management Practices*, page 13

Part J (1 mark):

Theory

What macronutrient is important for proper root development?

Answer: *phosphorus*

Source: *page 30 in Soil a Renewable Resource*

Part K (1 mark):

Theory

Using the satellite imagery provided. What is the dominant land use?

Answer: *cropland*

Source: *Soils binder, Soil: renewable resource, field training*

Wildlife (2 marks)

Theory

Name two tools for managing tall-grass prairie.

Answer: *Burning, controlled grazing, mowing or haying, removal of woody and exotic vegetation*

Source: *Wildlife binder - Tall-grass prairie preserve pamphlet*

Aquatics (2 marks)

Theory

Considering the limestone bedrock in the area would you expect Oak Hammock Marsh to have high (200 ug/g) or low (2 ug/g) alkalinity?

Answer: *high*

Source: *Aquatics binder page 34*

Wetlands (2 marks)

Theory

What Convention, adopted by many countries in 1971, recognises wetlands of international significance? There are two such wetlands in Manitoba. They are (_____) and (_____).

Answer:

- a) *Ramsar (1)*
- b) *Delta Marsh (0.5)*
- c) *Oak Hammock Marsh (0.5)*

Source: *Delta workshop*

Forests (2 marks)

Theory

Explain the difference between “deforestation” and “clear cutting”.

Answer: Clear cuts are reforested. Deforestation implies land is converted from forest to other non-forest use(s).

Source: Tomorrow's Forests.... Today's Challenge, Teacher Information Kit 85, page 5 and 6

Trail # 3

Stop # (_1_)

FORESTS (Soils, Wildlife, Aquatics, Wetlands)

Parking lot

FORESTS (12 marks)

Hands-on

At a table at trail head an enlarged aerial photo or photo-mosaic, with the woodlot outlined. Also include a ruler and scale bar on photo and a calculator. The goal is to calculate the volume by species for the plot and then project it over the woodlot. They will be given a tally sheet (we will design). They will be asked to calculate the area of the woodlot from the photo. On the trail a sample plot will be flagged. Since they will have already had a forestry equipment demonstration (as in the past by GPeterson) they will be asked to "survey" the plot. So they will measure height and diameter by species (oak and aspen) using the provided equipment (suunto and d-tape or calipers).

Notes: Should the students be given the area equation and simple tree volume equation (equate to cone or cylinder) or should that be expected of them?

Answer: We will require a trip to site to layout plot and determine answers.

Source: None needed? Training provided.

Soils (2 marks)

Hands-on

Examine the soil sample taken from the east side of Oak Hammock Marsh. Is it mineral or organic? The early settlers called the original marsh that existed on this site "St. Andrews Bog" because of the soggy nature of the soils. What type of soil, characterises a true bog?

Answer: The soil sample is organic. A true bog is characterised by peat (usually from Sphagnum moss)

Source: observation, Delta workshop

Wildlife (2 marks in total)

Theory

Part A (1 mark):

Canada contains what percent of the remaining wetlands on the globe?

- a) 10%
- b) 25%
- c) 50%
- d) 75%

Answer: b

Source: Hinterland Who's Who-Biodiversity (PG 4), Wildlife Binder

Part B (1 mark):

Theory

Before European settlement there were approximately 50-60 million bison in North America. In 1893, how many buffalo were remaining in Canada?

- a) 500
- b) 5000
- c) 50,000
- d) one million

Answer: a

Source: North American bison pamphlet, wildlife binder

Aquatics (2 marks)

Theory

Identify four significant changes to a watershed's hydrologic regime that may result from the removal of the watershed's tree cover?

Answer: Baseflow alterations, increased water temperature, increased nutrients and contaminants and increased sedimentation and turbidity.

Source: Aquatics binder page 78

Wetlands (2 marks)

Hands-on

Oak Hammock Marsh gets its name from the oak trees that grow on the higher, drier locations throughout the area. Identify the species of oak.

Equipment provided: Field guide to the Trees of Manitoba

Answer: Bur Oak

Source: Field guide

Trail # 3

Stop # (2)

FORESTS (Soils, Wildlife, Aquatics, Wetlands)

Near snag, layers, signs of harvest

FORESTS (12 marks)

Part A (3 marks):

Site specific

What is a snag? Name one benefit associated with snags. Name one problem associated with snags.

Answer: dead standing tree

Source: Wetlands and Woodlots

Part B (2 marks):

Site specific

Name two characteristics of a forest that determine the number of layers in a stand. What are the four layers that make up the vertical structure of a forest stand?

Answer:

Source:?

Part C (3 marks):

Theory

List three similar impacts of clearcutting and fire to a forest.

Answer: area is opened to full sunlight, removes forest floor material, allows for natural seeding

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

Part D (2 marks):

Theory

What main problem do trees have to overcome to grow in a swamp or a bog?

Answer: The main problem is getting oxygen to their roots. Normally trees obtain oxygen through their entire bodies (leaves, branches, trunk, and roots). When the spaces in the soil are filled with water, roots cannot obtain oxygen. Tree species that have adapted to live in wetlands (mangroves, cedar, tamarack, etc.) have solved this problem. Mangroves have special oxygen transporting tissue. Cedars and tamaracks both concentrate their roots in a mat near the soil surface. Willows can tolerate short-term flooding only.

Source: Wetlands binder, The function and types of wetlands (The Urban Outback, page 10)

Part E (2 marks):

Theory

Why do trees that grow in bogs (like cedar and tamarack) tend to concentrate their roots at the surface?

Answer: To obtain oxygen. The air spaces deeper down are filled with water.

Source: deduction, knowledge of root functions and Part D

Soils (2 marks in total)

Part A (1 mark):

Theory

Compared to soils formed under forests, soils developed under grassland tend to:

- a) be more fertile
- b) exhibit more sulphur deficiencies
- c) have deeper soil depth
- d) contain lesser amount of calcium and magnesium

Answer: c)

Source: page 22 in Soil a Renewable Resource

Part B (1 mark):

Theory

The process of water entering a soil and moving downward is called.

- a) capillarity
- b) infiltration
- c) decomposition

d) salinization

Answer: b)

Source: *Soil and Plant Ecology, Teacher Manual*

Wildlife (2 marks)

Theory

Circle the characteristic(s) shared by fathead minnow and brook stickleback.

- a) Are very tolerant of low dissolved oxygen
- b) Have low reproductive potential
- c) Are sensitive to salinity
- d) Are opportunistic carnivores

Answer: a) and d)

Source: *Delta workshop*

Aquatics (2 marks)

Theory

Which of the following water movement processes result in water moving upwards in its environment?

Circle your answer(s).

- a) transpiration
- b) capillarity
- c) percolation
- d) precipitation

Answer: a) and b)

Source: *Aquatics binder page 101*

Wetlands (2 marks)

Theory

Waterfowl in North America follow 4 major flyways. Name these flyways.

Answer: *Pacific, Central, Mississippi, and Atlantic*

Source: *Marsh World*

Trail # 3

Stop # (3)

WILDLIFE (Aquatics, Wetlands, Forests, Soils)

WILDLIFE (12 marks)

Theory

True or False

- a) Metaphyton blooms benefit invertebrates and fish. (_____)
- b) Invertebrates are an important food for waterfowl because they are high in energy content. (_____)
- c) Aquatic invertebrates form 98% of a duckling's diet during its first six days. (_____)
- d) Wetland fish require high oxygen concentrations. (_____)
- e) Summer kill of fish is the result of algal blooms. (_____)
- f) Seeding fathead minnows into potholes to supply the bait fish industry reduces the number of invertebrate taxa in these wetlands. (_____)
- g) Muskrat activity pushes a wetland into the regenerating stage. (_____)
- h) Shorebirds are attracted to wetlands during the regenerating marsh stage. (_____)
- i) Dabbling ducks prefer wetlands in the lake stage. (_____)
- j) Herbicides are used to control purple loosestrife in wetlands. (_____)
- k) The goal of marsh management is often to create a hemi-marsh. (_____)
- l) The "lake marsh" stage supports the greatest variety of wildlife. (_____)

Answer:

- a) *false, blooms of metaphytic algae decrease invertebrates and fish*
- b) *false, invertebrates are valuable because of their high protein content*
- c) *false, ducklings feed predominantly on terrestrial invertebrates emerging from the surface, they later learn to feed on aquatic invertebrates*
- d) *false, wetland fish tolerate low oxygen content*
- e) *true, summer kill results when algal blooms decompose – taking oxygen from the water*
- f) *true, fathead minnows reduce both numbers of invertebrates and numbers of taxa*
- g) *false, muskrat activity encourages the "lake marsh" stage*
- h) *false, shorebirds are attracted to the dry marsh stage*
- i) *false, dabbling ducks prefer the regenerating marsh stage, diving ducks prefer the "lake stage"*
- j) *false, insect herbivores (European beetles) are used to biologically control purple loosestrife because herbicides cannot be used in wetlands*
- k) *true, a hemi-marsh provides habitat for a wide variety of species*
- l) *false, a lake marsh attracts only open-water species*

Source: Delta workshop

Aquatics (2 marks)

Theory

How would cultivating a large portion of a watershed's landscape alter the magnitude and duration of the baseflows in the main waterway?

Answer: *Reduce the magnitude and shorten the duration.*

Source: *Aquatics binder page 81*

Wetlands (2 marks)

Hands-on

Identify these ducks from their wings

Equipment provided: *Know Your Ducks poster, 4 wings, field guide*

Answer: *American Black Duck, Gadwall, Blue-winged Teal, Bufflehead*

Source: *Know Your Ducks poster, 4 wings, field guide*

Forests (2 marks)

Theory

Where would you find more biological diversity (circle your answer)? Why?

- a) the transitional zone of a wetland and a woodlot, or
- b) the centre of a pine plantation

Answer: The transitional zone of a wetland and a woodlot because large numbers of plants, mammals, birds, insects, amphibians, reptiles, and fish live in these transitional zones

Source: Wildlife binder, Grassland and Forest Bird Project pamphlet, some deduction

Soils (2 marks)

Theory

What two pieces of information can soil colour provide?

Answer: Drainage, salinity, organic matter, carbonates,

Source: Soils 84 page 7

Trail # 3

Stop # (4)

At a site with a conk

FORESTS (Soils, Wildlife, Aquatics, Wetlands)

FORESTS (13 marks in total)

Part A (5 marks):

Hands-on

List 5 signs of forest maturity (old age) that you can find as you walk through this stand.

Answer: Conks, dead/dying trees, top die back (particularly in BW), moss on forest floor, insect damage, woodpecker holes in trees

Source: Forestry binder, From Rock to Tree, page 5 – moss development as part of a succession process

Part B (2 marks):

Hands-on

What type of lichen is this? (crustose, foliose, fruticose)

Equipment provided: sample of a lichen or near one on a branch

Answer: foliose

Source: Bollman? and possibly high school curriculum, Forestry binder – From Rock to Tree

Part C (2 marks):

Theory

A lichen is made up of what two organisms?

Answer: algae and fungus

Source: Soils binder, glossary definition

Part D (2 marks):

Site specific

Note the conks on the marked tree. What do these organisms indicate?

Answer: Conks are fruiting bodies of mushrooms. They indicate heartwood rot, over mature trees, with declining health.

Source: ?

Part E (1 mark):

Theory

This woodlot is undergoing "succession". What is the meaning of that term?

Answer: The gradual replacement of one community by another.

Source: Forestry binder, glossary

Part F (1 mark):

Theory

Describe how succession is happening.

Answer: The trembling aspen stand gradually becomes filled in with bur oak trees to become a mixed aspen-oak woodlot. Eventually the oaks completely dominate the stand.

Source: Forestry binder Tomorrow's Forests ... Today's Challenge page 2

Soils (no question at this stop)

There are 2 extra marks at stop 7.

Wildlife (2 marks)

Theory

Why are Peregrine Falcons impacted so strongly by chemicals such as herbicides and pesticides?

Answer: They are predators at the top of the food chain. They eat birds that have already eaten grain or insects containing these chemicals so, they are exposed to much higher levels of pesticide and herbicide than found in the air or water. They accumulate chemical residue levels hundreds of times higher than the levels in their prey species. This causes reproductive failure by interfering with breeding behavior, eggshell formation, and hatching success.

Source: Peregrine Falcon pamphlet, Wildlife Binder

Theory

Aquatics (2 marks)

What portion of the world's water is fresh water?

- a) 0.01%
- b) 1.0%
- c) 5.0%
- d) 9.0%

Answer: c) 5.0%

Source: Aquatics binder, Freshwater Series A-2 page 1

Hands-on

Wetlands (2 marks)

Using the sheets provided identify this forest plant.

Equipment: Wetland Ecology plant sheets, marker for plant, pressed plant of same species.

Answer: Wild rose (wood's rose).

Source: Wetland ecology identification sheets, field guide

Trail # 3

Stop # (5)

East end of trail

WETLANDS (Forests, Soils, Wildlife, Aquatics)

WETLANDS (12 marks in total)

Part A (5 marks):

True or False

- a) By definition, wetlands must have visible standing water. (_____)
- b) Manitoba has more land covered by wetlands than any other province. (_____)
- c) A recharge wetland is one where the water flows in from the groundwater. (_____)
- d) The maximum depth of water in a wetland is 4 metres. (_____)

Answer:

- a) *false*
- b) *true, Manitoba has 41% of its land area covered by wetlands,*
- c) *false, a recharge wetland is one that replenishes the groundwater*
- d) *false, the maximum depth of water in a wetland is 2 metres*

Source: Delta workshop

Part B (5 marks):

Theory

Wetland functions refer to the processes that take place in wetlands. Wetland values are the benefits derived from these processes. Which of the following are wetland functions. Circle the correct answer(s).

- a) store surface water
- b) hay production
- c) wild rice and cranberry production
- d) wastewater treatment
- e) groundwater recharge
- f) prevent flooding
- g) provide clean drinking water
- h) aquaculture (shrimp farming)
- i) provide water for wells and irrigation
- j) act as carbon sinks
- k) high primary productivity
- l) act as filters

Answer: *Wetland functions are: store surface water, groundwater recharge, acts as a sink for carbon, high primary productivity, and act as filters. The others are wetland values.*

Source: Delta workshop

Part C (2 marks):

Site specific

There are two types of wetlands that support trees. Name them.

Answer: *bog and swamp*

Source: *Delta workshop, Wetlands binder – The Canadian Wetland Classification System*

Forests (2 marks)

Theory

The plant marked is the seed head of Indian Pipe. The plant is usually white in colour. Why?

Answer: *This plant does not have chlorophyll to produce its own food, it must derive its nutrients from another plant.*

Source: *Field guide on site.*

Soils (2 marks)

Theory

List two effects topography and slope can have on vegetation.

Answer: *Moisture, temperature, evaporation, wind, soil formation*

Source: *Soils 84, page 11*

Wildlife (2 marks)

Theory

Why are wetlands crucial to many migrating northern forest songbirds?

Answer: *songbirds feed on the swarms of insects that hatch out in early spring.*

Source: *Delta workshop*

Aquatics (2 marks)

Theory

Explain what is meant by the concept of “limiting factors”.

Answer: All organisms have a physiological tolerance for each condition, or for each combination of conditions in its environment. Those conditions become limiting factors when tolerance levels are approached.

Source: Aquatics binder page 71

Trail # 3

Stop # (_6_)

WILDLIFE (Aquatics, Wetlands, Forests, Soils)

WILDLIFE (12 marks in total)

Part A (8 marks):

Hands-on

These pelts belong to wetland species that live within the Oak Hammock Marsh Wildlife Management area. Identify them.

Equipment provided: pelts, field guide to mammals, cards

Answer:

- a) *white-tailed deer*
- b) *raccoon*
- c) *coyote*
- d) *beaver*
- e) *muskrat*
- f) *mink*
- g) *red fox*
- h) *striped skunk*

Source: observation, deduction and materials supplied

Part B (2 marks):

Hands-on

Wing colour is used to identify waterfowl. What colour is the speculum on each of these wings?

Answer: Northern Shoveler (dark green), Green-winged Teal (green and black)

Source: Marsh World, Know Your Ducks Poster

Part C (2 marks):

Theory

Explain the difference between the terms extirpated and extinct.

Answer: An extinct species no longer exists anywhere. An extirpated species no longer found in the wild and a specific location, but is still found in other locations.

Source: Glossary, Wildlife binder

Aquatics (2 marks in total)

Part A (1 mark):

Theory

Define a river's watershed.

Answer: The area that drains into it.

Source: Aquatics binder, Freshwater Series A-2, page 3

Part B (1 mark):

Theory

The sediment load of a waterway is determined by multiplying its sediment concentration by what?

Answer: Its discharge or streamflow.

Source: Aquatics binder, Freshwater Series A-8, page 4

Wetlands (2 marks)

Hands-on

Identify the mount. Which species does it closely resemble?

Equipment: Field guide, mount of a Downy Woodpecker.

Answer: Downy Woodpecker. Hairy Woodpecker.

Source: field guide

Forests (2 marks)

Theory

List 2 reasons why you would avoid harvesting operations near wetlands.

Answer: erosion, shade, watershed, wildlife corridor, wildlife habitat, and run-off reduction, increased temperature, increased nutrients and contaminants, increased sedimentation and turbidity, loss of habitat, changes in water flow

Source: deduction and Aquatics binder pages 79-86

Soils (2 marks)

Theory

Why are coarse textured soils preferred for road construction rather than a clay soil?

Answer: Clays shrink and swell. They are also very slippery when wet!

Source: deduction from reading Soil Characteristics in Soils binder

Trail # 3

Stop # (_7_)

Near edge of bluff

SOILS (Wildlife, Aquatics, Wetlands, Forests)

SOILS (14 marks in total)

Part A (1 mark):

Hands-on

Using the model provided that simulates soil formation, which site, A or B, would have a greater percentage of clay?

Answer: Site B

Source: observation, Soils binder – Soils 84, page 11

Part B (2 marks):

Theory

Using the same model, deposition at site A would be considered (_____), while deposition at site B would be considered (_____).

- a) bedrock, morainal
- b) aeolian, lacustrine
- c) alluvial, lacustrine
- d) lacustrine, morainal

Answer: c) alluvial, lacustrine

Source: Soils 84, Page 11

Part C (1 mark):

Theory

Compared to sandy soil, a clay soil:

- a) is easier to till
- b) is more vulnerable to nutrient losses
- c) drains more quickly
- d) has a higher cation exchange capacity

Answer: d)

Soils 84, page 7

Part D (3 marks):

Theory

What is soil structure? How does soil structure affect plant growth?

Answer: Structure is the way soil particles hold together. It affects water properties, drainage, and aeration

Source: Soils 84, page 7

Part E (1 mark):

Theory

Soils with high levels of (_____) tend to have poor structure.

- a) calcium
- b) magnesium
- c) organic matter
- d) sodium

Answer: d)

Source: page 33 in Soil & Plant Ecology

Part F (4 marks):

Theory

Four active processes continually affect the formation of soils. Briefly describe each of the following:

- a) additions
- b) losses
- c) translocations
- d) transformations

Answer:

- a) addition - occur at the surface. solar energy, precipitation, organic material from dead vegetation
- b) losses - erosion, water movement, evaporation
- c) translocations - physical movement of soil, liquids, gases
- d) transformations - chemical changes, physical changes but no movement

Source: Soils 84

Part G (1 mark):

Hands-on

Two soil columns are placed in water (Sandy Loam and Sand). Which soil has the greatest capillary rise?

Answer: Sandy Loam

Source: observation

Part H (1 mark):

Theory

Using the columns in part G, the highest level the water has reached is called (_____)

- a) saturation
- b) field capacity
- c) permanent wilting point
- d) infiltration

Answer: b) field capacity

Source: Soil Management, BMP page 16

Wildlife (2 marks in total)

Theory

Part A (1 mark):

What is sustainable development?

Answer: Development that ensures that the use of resources and the environment today that does not damage prospects for their use by future generations.

Source: Glossary, Wildlife binder

Part B (1 mark):

Theory

How does a piping plover react when disturbed from its nest?

Answer: They silently slip off their nests and lead the predator away from the nest and may pretend to be injured.

Source: Piping plover pamphlet, wildlife binder

Aquatics (2 marks)

Theory

At what temperature on the centigrade scale is water most dense?

- a) 100
- b) 4
- c) 0
- d) -32

Answer b) 4 degrees

Source: Aquatics binder page 4

Wetlands (2 marks)

Theory

True or False

Avian botulism

- a) is a food poisoning that affects waterfowl, shorebirds, raptors and pelicans. (_____)
- b) is caused by Type C botulism toxins that spread easily to people. (_____)
- c) occurs in wetlands with little or no outflow. (_____)
- d) can be minimised through marsh management. (_____)

Answer:

- a) true

- b) *false*
- c) *true*
- d) *true*

Source: *Understanding avian botulism (blue sheet) in Wetlands binder*

Forests (2 marks)

Site specific

Oak trees produce thousands of acorns throughout their lifetime yet only a small percentage survives to become trees. Why?

Answer:

- a) *All the acorns didn't germinate.*
- b) *Deer damage.*
- c) *Weed competition.*
- d) *Rodent damage.*
- e) *Climatic conditions*
- f) *All of above*

Source:?