For markers' use only				
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

Team #

2012 MANITOBA ENVIROTHON TRAIL TEST

STOP 1

AQUATIC ECOLOGY (10 points)
EQUIPMENT

___
10

Using the Secchi disk provided, obtain a Secchi depth reading from the Winnipeg River near the outer end of the longest adjacent wooden dock. Watch your footing while on the dock, and be careful to maintain a firm grip on the disk hand-hold while taking the reading. Pay careful attention to the depth markings (black = 0.1 m interval, blue = 0.5 m interval, red = 1.0 m interval) on the Secchi line when determining the Secchi depth. Return the disk to the stop attendant when finished.
Answer the following questions: (2 points if estimate is within 10% of correct value; 1 pt if >10%<20%; 0 pt if >20%)

1. In the following blank, enter your Secchi depth estimate to the nearest tenth (0.1) of a metre. (1 pt)

Our Secchi depth estimate is _____ metres.

2. i) What does the Secchi disk actually measure? (1 pt)

_____

_____

ii) What is the relationship between Secchi depth and depth of photosynthesis in the water column? (1 pt)

_____

_____

Page Total

3. List three factors that can affect the magnitude of the Secchi depth reading. (1pt each for a total of 3 pts)

(i) _____

(ii) _____

(iii) _____

4. If a lake has an average Secchi depth of 10 metres, what term would be used to describe its trophic condition? (1 pt)

_____

5. Scenario: The owner of a cabin on a small, remote, boreal shield lake east of Pinawa began taking monthly Secchi Disk measurements beginning in May, 2003. In Fall, 2006, a road was bulldozed in to the lake and an electrical power line was brought in. A developer began constructing a dozen new cottages along the shore in Spring, 2007. By 2008 these cottages were complete, with lawns, automatic dishwashers, and other urban amenities, and were fully occupied during the summer months.
The cabin owner has continued his monthly Secchi measurements each year during the open water seasons and entered them into a table. He also produced a graph of the mean annual Secchi depths. These data are all shown on the sheet provided at this stop. Based on these data, answer the following:

i) What apparent trend do the results of this monitoring program show? (1 pt)

_____

_____

ii) Given the information provided in the scenario, what might explain this apparent trend? (1 pts)

_____

_____

Answers:

1. "correct" answer will be determined by averaging several measurements taken by the stop attendant at beginning, during, and end of field test, 2 pts if estimate is within 10% of correct value; 1 pt if >10%<20%; 0 pt if >20% (max of 2 pt) 2. i) Vertical penetration of sunlight (solar irradiance) into the water column (1 pt) ii) Photosynthesis can occur to depths two to three times the Secchi depth (1 pt) 3. Any three of the following: (1 pt each for a total of 3 pts) - particles suspended in the water column (e.g. algae, silt, etc.) - coloured dissolved material (e.g. dissolved organics) in the water column - clear sky versus cloud cover - angle of sun above the horizon (i.e. time of day) - reflection at the water surface (surface wave conditions) - vision of person taking the readings 4. oligotrophic or oligotrophy (1 pt) 5. i) The Secchi depth has been decreasing, particularly since 2008; the depth to which solar radiation is penetrating the water column

has been decreasing (1 pt) ii) Activities (e.g. dishwasher detergents, lawn fertilizers) associated with the new development (cottages) may be fertilizing the lake and increasing algal biomass which attenuates light penetration, silt from road construction and use, silt from erosion of disturbed shoreline (1 pt)

Reference:
Online Resources for Aquatic Ecology:
Aquatic Sampling Techniques, page 1.
A Primer on Limnology, Light, pages 6-7.

FORESTRY (2 points)

Define pioneer species, and give one example of a native tree that meets that definition (2 pts – 1 pt ea)

_____

_____

Answer:
A plant capable of invading bare sites such as a newly exposed soil surface, and persisting there until supplanted by successor species. Jack Pine, Trembling Aspen, Tamarack and to a lesser extent Black Spruce.

Reference:
Forestry binder, Glossary,

SOILS AND LAND USE (2 points)

1. Hydraulic conductivity is the rate of water movement over the soil. True or False (1 pt)

2. The rate of water movement through a soil is largely determined by the soil _____. (1 pt)

Answer:
False (1 point); Texture (1 point)
Reference:
Soil Management Guide, p. 46

WILDLIFE (2 points)
EQUIPMENT

Identify the two skulls using the provided plates.

A) _____(1 pt)

B) _____(1 pt)

Answer:
A. TBD B. TBD
Reference:
Mammals of North America, a Peterson Field Guide

THEME: NPS AND LID (2 points)

A) Fill in the blank (1 pt).

_____ is the most common pollutant from forest harvests.

B) Pre-harvest management plans are developed and used by forest managers to limit the negative impacts of forestry on water quality.
Name 2 components of such a pre-harvest management plan. (1 pt - 0.5 pts each)

_____

_____

Answer:
A) Sediment B) Identify area to be harvested, locate special areas of protection (wetlands, riparian areas), proper timing of forestry activities, management measures for road layout, design, construction and maintenance, discuss harvesting methods and forest regeneration.
Reference:
Ontario Theme Study Guide, page 24-25

STOP 2

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Identify the invertebrate (common name) that you see moving around on top of the water surface. Use the key provided if required.
(1.0 pt)

A1._____

What physical property of water creates a film on the surface allowing this invertebrate to stay on the surface? (0.5 pts)

A2._____

The ability of the liquid to climb against the pull of gravity is called _____.
(0.5 pts)

Answer:
A. water strider B. surface tension C. Capillary
Reference:
Online Aquatic Resources - Invert key
Aquatic Ecology Document, page 6

FORESTRY (2 points)

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

1) _____

2) _____

Answer:
housing timber and furniture, others check

Reference:
Event Training, also What Trees can do…

SOILS AND LAND USE (2 points)
EQUIPMENT

Soil structure refers to the way in which soil particles cling together to form aggregates.
A) What type of structure does sample A have?

_____

B) What type of structure does sample B have?

_____

Answer:
To be determined - 1 point each
Reference:
Soil Management Guide, pp 14-15 and training session

WILDLIFE (10 points)
EQUIPMENT

A) Identify the endangered species displayed. (1 pt)

_____

B) Where in Manitoba would you find this species? (1 pt)

_____

C) Give three habitat requirements for this species (3 pts)

_____

_____

D) Provide three factors that have contributed to this species becoming endangered. (3 pts)

_____

_____

_____

E) Give two (2) different physical adaptations of this species. (2 pts)

_____

_____

Answer:
a) *Burrowing Owl*
b) South western Manitoba
c) Low Lying Ground cover, short vegetation, near open terrain, a burrow to nest in.
d)

- *Chemical pesticides, applied to control ground squirrels and grasshoppers, sometimes poison the Burrowing Owl.*
- *The extermination of burrowing mammals reduces the number of suitable homes for the Burrowing Owl*
- *Hit by cars along roads*
- *Habitat loss and changes in the quality of habitat reduce hunting and nesting territories*
- *Natural predators*

e) Silent Flight, 270 head rotation, zygodactyls toes, pellets, many options

Reference:
Burrowing Owl Fact Sheet
e) From session

THEME: NPS AND LID (2 points)

(1 pt - 0.5 pts each)

1. True or False: Circle the correct response.
   a) Macrophytes are benthic algae that grow attached to rocks. T F

   b) Macrophytes are an excellent indicator species because they respond to a wide variety of environmental conditions. T F

2. What does an excess of macrophytes indicate?

   _____(0.5 pts)

3. What does a lack of macrophytes indicate? (0.5 pts)

   _____

Answer:
1a. False – they are aquatic plants that grow in or near water. 1b. True
2. high nutrient levels
3. at least one of: water quality problems, excess turbidity, herbicides or salinization (high salt).

Reference:
Envirothon Study Guide 2012, Nonpoint Source (NPS) Pollution and Low Impact Development (LID) in Ontario, page 20

STOP 3

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Using the Key to Aquatic Plants identify by common name the:

1. aquatic plant marked with flagging tape _____(1.0 pt)

Dense stands of emergent plants as identified with the flagging tape can tolerate varying water levels. In what two (2) ways do emergent plants protect shorelines? (1 pt - 0.5 pts each)

_____

_____

Answer:
A. cattail (need to determine if narrow or broad leafed cattail) 1.0 pt for full name 0.5 pts for just cattails 3. dampen shoreline waves; dissipates force of land runoff; roots spread horizontally forming interlocking network growth pattern important for stabilizing sediment.

Reference:
Online Aquatic Resources -
A Key to Aquatic Plants, page 36 and 6

FORESTRY (2 points)
EQUIPMENT

It has recently been decided that the Canadian penny be removed from Canadian currency. Agree with it or not, one forestry argument to support this action might be because a maple characteristic is incorrectly shown on the penny.
(refer to picture and the Field Guide provided)

1. What is the technical term for the arrangement of leaves and buds found on Maples? (1 pt)
   _____

2. Name one tree species found in Manitoba that has this characteristic but is not a maple. (1 pt)
   _____

Answer:
1. *Maples have opposite branching*
2. *Green Ash, Black Ash*

Reference:
Field Guide - Native Trees of Manitoba, page 11

SOILS AND LAND USE (2 points)

Soil texture is the relative proportion of _____, _____, and _____ particles measuring less than ____ mm in diameter. (0.5 pts each)

Answer:
Sand (0.5 pt), silt (0.5 pt), clay (0.5 pt), 2.0 (0.5 pt)

Reference:
Soil Management Guide, p. 11

WILDLIFE (10 points)

1. What is the definition of a raptor? (1 pt)

   _____

2. Please list the six major types of raptors found in Manitoba. (6 pts)

   _____

   _____

   _____

   _____

   _____

   _____

3. Why are raptors an important environmental barometer? (1 pt)

   _____

4. A. In the 1960s, declining Peregrine Falcon populations indicated an environmental crisis. Please identify the cause of the population decline, how it made its way into the Peregrine Falcons' system, and the specific long term effect upon the Peregrine species. (2 pts)

   _____

Answer:

1. *Also known as a bird of prey it is a bird that hunts and kills for its food*
2. *Eagles, Owls, Falcons, Hawks, Osprey and Vultures*
3. *As they are on the top of the food pyramid their populations provide a good indication of the ecosystems underlying health. They can indicate when pesticides and chemicals are entering the ecosystem via their food and effecting raptors reproduction.*
4. *Peregrines are at the top of a food chain. Because they ate birds that may have eaten grain or insects treated with pesticides (DDT), the Peregrines were exposed to much higher levels of pesticide residues than were found in the air or water. Pesticide residue levels in their bodies would have been many times higher than the levels in their prey species. This caused reproductive failure by interfering with breeding behaviour, eggshell formation, and hatching success.*

Reference:

Session
Peregrine Falcon Fact sheet

THEME: NPS AND LID (2 points)

There is a storm drain outlet into the Winnipeg River nearby that could deliver organic matter and nutrients to the River. Both these pollutants can lead to oxygen depletion in an aquatic environment.

1. What is a consequence of oxygen depletion in an aquatic environment? (0.5 pts)

_____

_____

(1.5 pts – 0.5 pts each)

2. a) What is anaerobic decomposition?

_____

b) What performs anaerobic decomposition?

_____

c) What smelly and toxic substance is produced during anaerobic decomposition.

_____

Answer:

1.fish and other aquatic organisms don't have enough oxygen for respiration; become stressed and may die
2a. decomposition in the absence of oxygen
2b. Bacteria 2c. hydrogen sulphide

Reference:

Ontario Theme Study Guide – page 16

STOP 4

AQUATIC ECOLOGY (10 points)

EQUIPMENT

Lake Sturgeon are a descendant of an ancient lineage of bony fishes. They are found in a number of reaches within the Winnipeg River, although not in the numbers found historically. They are a long lived species that require up to as many as 25 years to mature. Once mature the females do not spawn every year. As a Fisheries Biologist it is important to have an understanding of the Lake Sturgeon biology and behaviour. To gain a better understanding of how the population is doing within the Winnipeg River annually you conduct a monitoring program setting gill nets of different panel sizes in predetermined locations and specific times to collect sturgeon and gather length, weight, sex, maturity and aging data.

A. Using the equipment provided, how old is this Lake Sturgeon? (1 pt)

_____

B. From the graph titled Winnipeg River 2011 – Lake Sturgeon Ages answer the following questions.

1. How many Lake Sturgeon collected last year would have been considered mature? (1 pt)

   _____

2. Note that many younger year classes are not represented in the graph. List one (1) reason why these year classes may be under represented in this data set? (1 pt)

_____

3. What year were the age 39 sturgeon born? _____(0.5 pts)

C. According to the Angling Guide, what is the possession limit for sturgeon? (0.5 pts)

_____

D. 1. Identify the two features marked on the fish: (2 pts – 1.0 pts each)

D A. _____

D B. _____

Page Total

D. 2. What is D A used for? (0.5 pts)

_____

D.3. How can non point source pollution affect the function of this structure? (0.5 pts)

_____

E. Fish can be used as indicators of ecosystem health as well as macroinvertebrates, macrophytes and periphyton. One advantage with macroinvertebrates is that individual species tolerate differing amounts and types of pollutants. Identify the species using the laminated key and book and indicate its pollution tolerance. 3 pts (2 pts identification; 1 pt for correct tolerance)

Species	Pollution Tolerance (very tolerant; somewhat tolerant; sensitive)
E1. _____	E2. _____

Answer:

A. 13 (accept12) B.1 82 B2. looking for sampling techniques/location not specific for YOY or juveniles but could also be reflective of weak year classes due to poor spawning year classes or environmental effects on spawning - limited habitat for juvenile stages. B3. 1972 C. zero D A gills D B adipose fin D2. Used for breathing, water is passed over the gills and the gills take out the oxygen D3. Sediment clogs the gills. E 1 Broadwinged damselfly E 2 Somewhat tolerant.

Reference:

A. Field Training; B. graph interpretation expected to be known C. field training
D-F: Online Aquatic Resources and Theme Guide

FORESTRY (2 points)

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

_____

_____

Answer:

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

Reference:

Envirothon CD: What Trees can do to reduce atmospheric CO2

SOILS AND LAND USE (2 points)

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

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

_____

b. List two (2) methods that could be used to stabilize this area. (1 pt – 0.5 pts each).

1. _____

2. _____

Answer:

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

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

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

Reference:

Critical thinking

WILDLIFE (2 points)

EQUIPMENT

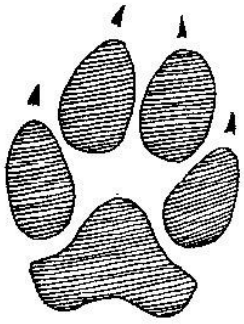
A) What animal has left these drag marks? (0.5 pts)

_____

B) What other signs in the area support this conclusion? (0.5 pts)

_____

C) Which print belongs to a Felidae and which belongs to a Canidae? (0.5 pts)



_____ _____

D) How do you know? (0.5 pts)

_____

Answer:
A) Beaver
B) At least one of: Beaver marking on trees, Tracks
C) Left –Felidae Right-Canidae
D) Missing Toenails on Felidae as cats retract claws.
Reference:
Training session
Identifying and Preserving Animal Tracks

THEME: NPS AND LID (2 points)
EQUIPMENT

Refer to the table provided at this stop and answer the following questions.
A) What type of riparian woodland is present at this stop? (0.5 pts)

_____

B) Name one of the dominant tree species for this type that is present in the area of this stop. (0.5 pts)

_____

C) What are two (2) significant functions of the trees in this riparian cover type? (1 pt - 0.5 pts each)

_____

Answer:
A) Upland Hardwoods (.5) B) Ash, oak, poplar, birch, sugar maple, beech, hickory, black cherry C) Bank/shore stability, sediment filtration, pollutant removal

Reference:
Ontario Theme Study Guide, page 35

STOP 5

AQUATIC ECOLOGY (2 points)

Producers may support some food chains in slower streams, but in fast flowing water like the Winnipeg River the source of food for the bottom of the food chain is different. Where does it come from? (0.5 pts)

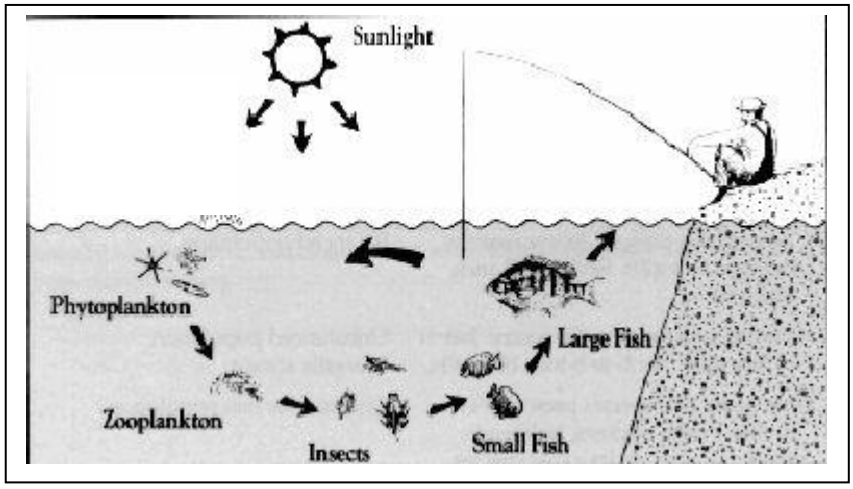
_____

Food chains that begin with non-living organic matter like twigs and leaves are called

_____ food chains. (0.5 pts)

The picture below best describes a (circle the appropriate answer): (0.5 pts)

a. food web
b. food triangle
c. food chain



In the diagram above circle the level of the food chain that represents the top carnivore. (0.5 pts)

Answer:

A. Most of it enters the water from the surrounding land. B. Detritus Is heterotrophic or other-feeding also correct? C. c D. the human

Reference:

Online Aquatic Resources
Aquatic Ecology Document pages 14 & 23

FORESTRY (2 points)

Describe two (2) ecological benefits that forest fires create in the forest. (2 Pts - 1 pt ea)

1) _____

2) _____

Answer:
reduces dead and dry organic matter, stimulates new growth, exposes mineral soil, stimulates germination of certain species, reduced fire hazard by reducing litter accumulation, allows se-seeding of pioneer or shade intolerant species,
Reference:
Fire Ecology **in Forestry Document, pages 9 and 10.**

SOILS AND LAND USE (2 points)

(A) What form of soil degradation has been caused by the ATV/walking trail? (1 pt)

_____

(b) List two problems associated with this type of soil degradation. (1 pt - 0.5 pts each)

_____

_____

Answer:
(A) Compaction (1 point), (b) Restriction of rooting depth, less plant uptake of nutrients/water/oxygen, decreased pore size, increased proportion of water-filled pore space at field moisture, decreased soil temperature, decreased microbial activity, decreased infiltration, increased water erosion (0.5 points each)
Reference:
Reference: Compaction (USDA, NRCS, Soil Quality Information Sheet)

WILDLIFE (2 points)
EQUIPMENT

Complete the following table for hunting the species in front of you in the area around Pinawa. (0.5 pts each)

Hunting zone: _____

Season dates: _____

Daily Limit: _____

Team #

2012 Manitoba Envirothon
Trail Test

Possession Limit: _____

Answer:
Zone - GBHZ3 or GBHZ4, Dates - Sept 8 – Dec 18, Daily -6, Possession -12
Reference:
Manitoba Hunting Guide 2011 in conjunction with Highways map
MHG – Pg 42 For Zone and Pg 45 for Dates/Limits
Manitoba Birds Field Guide (Grouse Pg 57-60)

THEME: NPS AND LID (10 points)
EQUIPMENT

A) Riparian woodlands function best if they are _____ and

_____ (2 pts - 1 pt ea)

B) Trees and understory plants in riparian woodlands filter _____ and

_____ from runoff. (2 pts -1 pt ea)

C) _____ is the primary source of NPS pollution on forested land, accounting for up to 90% of the total sediment from forestry operations. (1 pt)

D) Planning for proper timing of forest operations can have a significant impact on water quality. Circle the best answer. (1 pt)

Local events to be considered are:

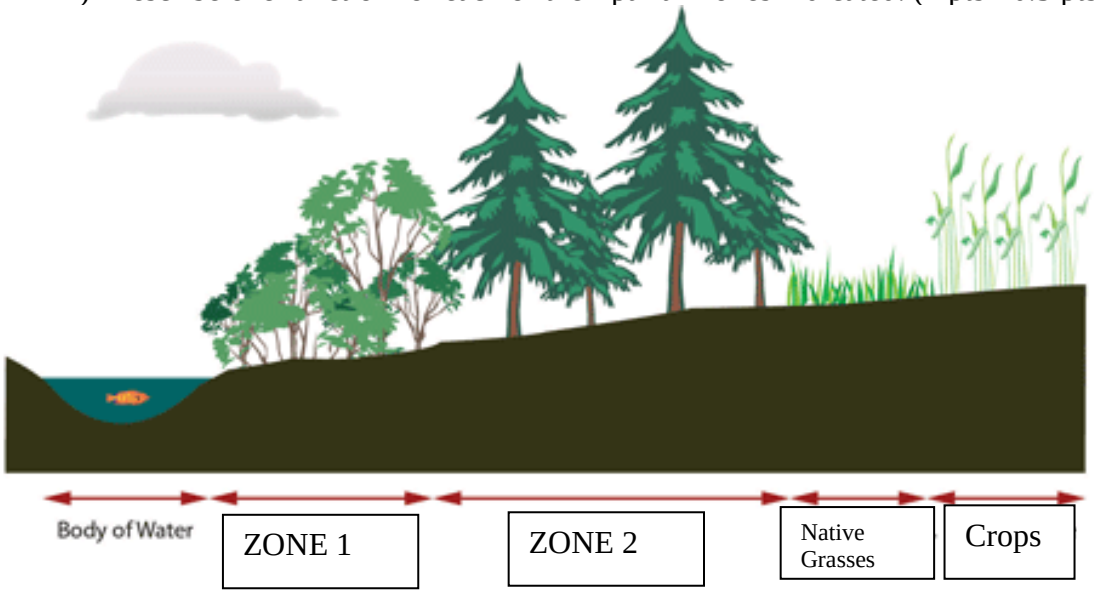
i) rainy seasons

ii) spawning sites

iii) fish migration

iv) all of the above

E) Describe one function for each of the riparian zones indicated. (2 pts - 0.5 pts ea)



Page Total

Zone 1: _____

Zone 2: _____

F) Forest damage at this site could occur during any season. Refer to the picture provided. What **winter** activity likely caused the forest and soil damage which is shown in the picture and which is still evident? (2 pts)

_____

_____

Answer:

A) Two of: natural/undisturbed, extensive/wide, contiguous/uninterrupted, B) sediments, contaminants/pollutants C) road construction and use , D) iv - all the above, E) Zone 1: shade water, stabilize bank; Zone 2: provide distance between stream and development, filter sediment, store sediment, promote infiltration F) snowmobile usage

Reference:

Theme Doc, Page 28-29

STOP 6

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Examine the concept map (provided) showing the interrelationships of various watershed inputs and chemical parameters that can be monitored in a river or stream. The inputs are shown as rectangles, while the chemical parameters are shown as ovals. Note that in four of the chemical parameter ovals, the labels have been removed and replaced by only the letters A, B, C and D.

These missing labels are listed below, in alphabetical order. Beside each, write the letter (A, B, C or D) from the oval in which that label belongs. (0.5 pts each for a total of 2 points)

B.O.D. _____

Dissolved oxygen _____

Phosphates _____

Turbidity _____

Answer:
BOD C; Dissolved Oxygen B; Phosphates A; Turbidity D

Reference:
Online Resources for Aquatic Ecology:
Chemical Monitoring, page 5 (labelled 33)

FORESTRY (10 points)
EQUIPMENT

Using the equipment provided, please measure the marked trees in this "Permanent Sample Plot" which was last measured in 2008 when the Manitoba Envirothon last used this site. Record the information gathered in the correct places on the tally sheet provided and perform the calculations required. Please ensure your team number is marked on the tally sheet and it is returned with the rest of your test!

Answer:
TBD should develop a marking range where half points are given for "close" answers

Reference:
Forestry Equipment demonstration at Regional Workshop

SOILS AND LAND USE (2 points)
EQUIPMENT

You are provided with a photograph showing a bedrock outcrop.
(A) Given the geology of the area, what type of material is this bedrock?

_____

(B) What is the name of this larger geographic area from which these types of outcrops are found?

_____

Answer:
(A) Granite or igneous, (b) Canadian Shield (1 point each)
Reference:
(A) Soil Management Guide, page 8; (B) Local knowledge

WILDLIFE (2 points)
EQUIPMENT

Using the Manitoba Bird guide provided please identify the two birds in the tree ahead of you.

* Keep an eye out for other indications of what the species may be nearby

A) _____

B) _____

Answer:
A) Yellow-Bellied Sapsucker
B)Pileated Woodpecker
Reference:
Manitoba Bird guide and general knowledge of the use of guide books
A)Pg 89 B)Page 93.

THEME: NPS AND LID (2 points)
There are many different types of sediment barriers. List two.

_____

Answer:
Any of the following: sandbags, hay/straw bales, brush from clearings, biofilters, silt fences (2 points)
Reference:
Ontario Theme Document, p. 38

STOP 7

AQUATIC ECOLOGY (10 points)
EQUIPMENT

Wetlands are a large and important part of the Canadian Landscape.

1. List any four (4) of the five classes (types) of wetlands in Canada. (0.5 pts each = 2 pts)

_____ _____

_____ _____

2. From the choices listed below, circle the number that best represents the percentage of Canada that is occupied by wetlands. (1 pt)

4% 14% 34% 54%

3. From the choices below, circle the number that best represents the percentage of Manitoba that is occupied by wetlands. (1 pt)

11% 21% 41% 61%

4. Examine the satellite photo (provided), which covers a land and water area of approximately 100 square kilometres. It includes the town of Pinawa (lower right) and the rural area immediately north and west of Pinawa. There are many wetlands scattered over this region. In this photo, seven (7) areas of wetland have been identified and delineated by highlighting (in yellow) their approximate boundaries. A grid has been superimposed over the entire image to permit an estimate of the percentage of wetland compared to the entire surface area of the photo. The total grid size is 45 by 31, or 1395 areal grid units. The size of each of the seven delineated wetland areas has been calculated in terms of grid units, and those numbers are printed on each wetland area.

Using the information on this diagram, estimate the percentage of wetland within this selected area of Manitoba?

Show your calculations in the space below to obtain partial marks if you should make a calculating error.

The percentage area occupied by wetlands is _____% of the total area. (2 pt)

5. Would you expect the percentage of wetland within the Red River valley to be greater or less than this percentage near Pinawa? (0.5 pt)

_____

Why? (1 pt)

_____

_____

6. List five (5) human-induced stresses on wetlands. (2.5 pts = 0.5 pts each)

_____

_____

Answer:

1. Any four of bogs, fens, swamps, marshes, shallow waters (1/2 pt each = 2 pts) 2. 14% (1 pt) 3. 41% (1 pt) (503+66+20+6+5+3+2)/1395x100 = 43.4% (2 pts) 5. less (1/2 pt); most of the natural wetlands in the Red River valley have been drained or filled in (1 pt) 6. Any five of the following: (1/2 pt each = 3 pts) - draining, dredging, filling, nutrient loading, sedimentation, toxic chemicals, invasive species, water level

Reference:

Online Resources for Aquatic Ecology:

Wetlands, pages 1, 3, 9-15
Sustaining Aquatic Ecosystems in Boreal Regions, page 14
How to Read a Topographical Map and Delineate a Watershed

FORESTRY (2 points)

EQUIPMENT

The sample at this stop shows serpentine larval feeding galleries made by an invasive species that was discovered in North America in 2002.

A) Which invasive pest typically makes this serpentine pattern underneath the bark? (1 pt)

_____

B) There are 3 trees marked A, B and C at this site. Which species of tree does this pest attack? Circle the correct answer. A B or C

If required, you may use the field guide provided. (1 pt)

Answer:

A) Emerald Ash Borer (1 point) B) TBD (1 point)

Reference:

Manitoba Envirothon Forestry Document (under website references: http://web.extension.uiuc.edu/forestry/forest_health.html; there is a link to emeraldashborer.info on this page), Field Guide to the Native Trees of Manitoba

SOILS AND LAND USE (2 points)

A soil scientist has provided you with laboratory data showing the masses of various fractions contained within the soil sample.

62.5 g sand
100 g silt
87.5 g clay
25 g organic matter

If you wanted to determine the texture of the sample using a textural triangle, you would need to know the percent silt. Calculate percent silt from the data above.

_____

Answer:
100/250 = 40 % silt (2 points)
Reference:
Soil Management Guide, p. 11 - Calculation

WILDLIFE (2 points)

A) What type of Tick carries Lyme Disease? (0.5 pts)

_____

B) Do all of these ticks carry the disease? (0.5 pts)

_____

C) How do the ticks transfer the disease? (0.5 pts)

_____

D) How long must a tick be attached in order to transmit the bacteria? (0.5 pts)

_____

Answer:
a) Blacklegged Tick (Deer Tick)
b) No
c) Bite
d) 24 hours or more
Reference:
Lyme disease Fact Sheet

THEME: NPS AND LID

(A) What is the relationship between slope and rates of water erosion and runoff?

_____

(B) On what surface soil texture would runoff be expected to be the greatest?

_____

Answer:
(A) greater the slope, the greater the rate of runoff and erosion; (B) clay soils
Reference:
Ontario Theme Document, p. 37

STOP 8

AQUATIC ECOLOGY (2 points)
EQUIPMENT

1. Identify the aquatic invasive species A and B provided at this stop (common name). Use the key provided to identify A if required. (1 pt - 0.5 pts each)

A. _____

B. _____

2. Describe two (2) ways Species C affects an aquatic ecosystem where it is not native. (1 pt - 0.5 pts each)

_____

_____

Answer
A. White bass or common carp B. Rusty crayfish
Reference:
Online Aquatics Resource: ANS brochure
STOP AIS poster and spiny water flea fact sheet distributed at regional training

FORESTRY (10 points)
EQUIPMENT

Dendrochronology and Species ID Points as Marked.

A) Using the samples provided and \ or the flagged example, and the Native Trees of Manitoba Field Guide provided, please identify the two following specimens and mark them below.

i) _____ (1 pt)

ii) _____ (1 pt)

B) The tree cookie sample provided was harvested from a forest near Lac Du Bonnet in 2010. Using the samples and equipment provided at this stop please determine the age of this tree when it was harvested.

_____ yrs. (2 pts)

C) Multiple choice. Circle the best answer. (1 pt ea)

i) How would you define the trees growth rate during the period 1985-1989 as shown by the annual rings?

a) slow
b) average
c) fast
d) cannot tell

ii) How would you define the trees growth rate during the period 1990-1995 as shown by the annual rings?

a) slow
b) average
c) fast
d) cannot tell

D) Referring to the graph provided at this stop, name one (1) factor which could explain your answer in C i) and ii) above. (2 pts - 1 pt ea)

i) _____

ii) _____

E) i) Which of the following principles (scientific rules) must all tree-ring research adhere to? Circle the best answer (0.5 pts)

a) The Principle of Limiting Factors

b) The Principle of Aggregate Tree Growth

c) The Principle of Site Selection

d) The Principle of Crossdating

e) All the above

ii) Please define one of the above (a-d) Principles (1 pt)

_____

_____

_____

F) Define a tree ring (0.5 pts)

_____

_____

Answer:
A i) Basswood (on site) and ii) sample tbd. B) C) and D) tbd on site, E) i)-e, ii) All main ref'd webpage: The Principle of Limiting Factors:As used in dendrochronology, this principle states that rates of plant processes are constrained by the primary environmental variable(s) that is most limiting. For example, precipitation is often the most limiting factor to plant growth in arid and semiarid areas. In these regions, tree growth cannot proceed faster than that allowed by the amount of precipitation, causing the width of the rings (i.e., the volume of wood produced) to be a function of precipitation. In some locations (for example, in higher latitudes and elevations), temperature is often the most limiting factor. The Principle of Aggregate Tree Growth: This principle states that any individual tree-growth series can be "decomposed" into an aggregate of environmental factors, both human and natural, that affected the patterns of tree growth over time. The Principle of Site Selection: This principle states that sites useful to dendrochronology can be identified and selected based on criteria that will produce tree-ring series sensitive to the environmental variable being examined. For example, trees that are especially responsive to drought conditions can usually be found where rainfall is limiting, such as rocky outcrops, or on ridgecrests of mountains. The Principle of Crossdating:This principle states that matching patterns in ring widths or other ring characteristics (such as ring density patterns) among several tree-ring series allow the identification of the exact year in which each tree ring was formed. For example, one can date the construction of a building, such as a barn or Indian pueblo, by matching the tree-ring patterns of wood taken from the buildings with tree-ring patterns from living trees. Crossdating is considered the fundamental principle of dendrochronology F) A layer of wood cells produced by a tree or shrub in one year, usually consisting of thin-walled cells formed early in the growing season (called earlywood) and thicker-walled cells produced later in the growing season (called latewood).
Reference:
A) Field Guide Key, B) C) D) E) F) event training and Henri D. Grissino-Mayer's Ultimate Tree-Ring website,

SOILS AND LAND USE (2 points)

Gleying is a soil-forming process which occurs under poorly drained soil conditions. What are two indications of gleying in soil?

_____

_____

Answer:
Dull or gray colours (1 point), presence of mottles (1 point)
Reference:
Soil Management Guide, p. 15

WILDLIFE (2 points)

A) What is a Wildlife Management Area? (1 pt)

_____

_____

B) In addition to hunting and trapping, what other recreational activity are WMAs intended for? (1 pt)

_____

Answer:

a. Wildlife Management Areas (WMAs) are Crown lands designated by the Province of Manitoba for the protection of wildlife habitat.

b. wildlife viewing

Reference:

Manitoba Hunting Guide 2011 (pg 13)

THEME: NPS AND LID (2 points)

Residential areas can be a source of several types of nonpoint sources of polluted runoff. The town of Pinawa's storm drains empty into the Winnipeg River and the town gets its drinking water from that same River. That water is treated for human consumption at the Water Treatment facility nearby. Place the correct type number in front of the residential source of pollution.

Type	Source
1. Nutrients	_____household products, pesticides
2. Pathogens	_____lawn fertilizers
3. Sediments	_____malfunctioning septic systems, pet waste
4. Toxic contaminants	_____construction sites, erosion from lawns, road sand

Answer

4,1,2,3 (0.5 pts each)

Reference:

Ontario Theme Study Guide - page 18

STOP 9

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Note the satellite photograph provided at this stop. A few kilometres downstream from Pinawa is the Seven Sisters dam and hydroelectric generating station. This dam backs water upstream beyond Pinawa, making this section of the Winnipeg River a reservoir.

List four (4) characteristics of the ecosystem in this section of river that will be significantly different because of the Seven Sisters dam. (0.5pts ea = 2 pts)

_____

_____

_____

_____

Answer:
Any four of the following: (1/2 pt each = 2 pts) deeper water, less (slower)current, less sediment transport, more light transparency, more algal photosynthesis, reduced fish migration, more lake species, fewer riverine species.
Reference:
Online Resources for Aquatic Ecology:
Aquatic Ecology Document, pages 14-15.

FORESTRY (2 points)
EQUIPMENT

A) What animal caused the damage on the marked tree. (1 pt)

_____

B) The sample provided grew on an aspen tree trunk and is indicative of forest health. (1 pt)

It is commonly referred to as a _____

Answer:
A) Yellow bellied sapsucker, b) conk
Reference:
Wildlife or forestry training, general knowledge

SOILS AND LAND USE (10 points)
EQUIPMENT

Observe the soil pit at this stop.
a. Describe the type of structure you see within the A horizon (1 pt)

_____

_____

b. Using a ruler, determine the soil depth of the A horizon? (1 pt)

_____

_____

c. Are there carbonates present within the soil profile, and if so, at what depth? (1 pt)

_____

_____

d. Using the Munsell colour chart, determine the colour of the parent material ? (1 pt)

_____

_____

Using the Canadian System of Soil Classification, key out the soil to the subgroup level; (Hint: Not a Podzol)
e. Soil Order (2 pts)

_____

f. Great Group (2 pts)

_____

g. Subgroup (2 pts)

_____

Answer:
This is a 10 mark question, broken down accordingly; a-d are TBA, for one mark each & e-g are TBA for two marks each
Reference:
The Canadian System of Soil Classification handbook

WILDLIFE (2 points)

A) Humans have been responsible for introducing some invasive plant and animal species to Manitoba. Describe two specific ways humans have introduced invasive species, one for aquatic invasive species and one for terrestrial invasive species. (0.5 pts each)

1. Aquatic: _____

2. Terrestrial: _____

B) Briefly describe how invasive species might arrive without the help of humans. (0.5 pts)

_____

_____

C) Briefly explain why climate change might increase the number of invasive species in Manitoba. (0.5 pts)

_____

_____

Answer:

a) Invasive species can be introduced or spread through global and regional movement of goods and people via air, rail, water, or roads. They can also spread through their own natural dispersal methods such as using wind and especially water flow. Climate change, with its warming environment may allow less cold tolerant species to spread north and invade new territory.

b) 1- Boats, fishing equipment any example through water
2- Gardening, vehicle transfer any example through land

Reference:

Invasive Species of MB - Page 2

THEME: NPS AND LID (2 points)

A) Define green infrastructure. (1 pt)

_____

B) Describe how it lessens the effects of NPS pollution. (1 pt)

_____

Answer:

a) Naturally occurring forests, shrubs and grasslands.
b) It helps prevent storm water runoff and the associated negative consequences of NPS pollution. It buffers physical and chemical pollution benefiting wildlife.

Reference:

Ontario Study Guide pg 44

STOP 10

AQUATIC ECOLOGY (2 points)

Lakes are classified according to their trophic state. Lakes that have high nutrients and high plant growth are classified as _____. (0.5 pts)

Lakes that have low nutrient concentrations and low plant growth are classified as _____. (0.5 pts)

The trophic state of a lake is regulated by three main factors. Name two (2) of the factors. (1 pt)

_____

_____

Answer:
A.eutrophic B. oligotrophic C. 1.Rate of nutrient supply (Bedrock geology of the watershed l Soils l Vegetation l Human landuses and management) 2.Climate (Amount of sunlight l Temperature l Hydrology (precipitation + lake basin turnover time)) 3.Shape of lake basin (morphometry)- Depth (maximum and mean) l Volume and surface area l Watershed to lake surface area ratio (Aw : Ao)

Reference:
Online Aquatic Resources -
A Primer on Limnology - page 34

FORESTRY (2 points)
EQUIPMENT

A) Silviculture is defined as: (1 pt)

_____

_____

B) Clearcutting is used for two major forestry functions. Briefly describe each (1 pt - 0.5 pts ea)

_____

_____

Answer:
the art and science of growing trees or cultivating a forest, a harvesting method; cost effective, energy efficient way to maximize harvest is even aged stands, silvicultural method, a step in regeneration process to recreate even aged stands

Reference:
MC website, Clearcutting in Manitoba.

SOILS AND LAND USE (2 points)
EQUIPMENT

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

(A) _____

(B) _____

Answer:
TBD (1 point each)
Reference:
Soil Management Guide, p. 148

WILDLIFE (2 points)

A) Describe two (2) ways Peregrine Falcons have adapted to urbanization?

_____

B) Name another animal that has adapted to urbanization and briefly describe one way it has adapted.

_____

Answer:
A) They have taken to being in cities by nesting on high buildings, and feeding off of local birds that are abundant in cities.
B)Many possible answers
Reference:
Training Sessions and common knowledge

THEME: NPS AND LID (10 points)
EQUIPMENT

1. What is nonpoint source (NPS) pollution? (1 pt)

_____

2. How is point source pollution different from NPS? (1 pt)

_____

3. Look around the very near vicinity of this stop.
    a. What is the most likely non-point source of pollution? (0.5 pts)

b. Name 2 likely pollutants contributed to the Winnipeg River from this source? (1 pt)

4. Using the town site map of Pinawa (Map 1), name 1 other possible <u>non-point</u> site of pollution to the Winnipeg River. Give one likely pollutant associated with the source. (2 pts – 1 pt each)

   Site _____ Pollutant _____

5. Using the town site map of Pinawa (Map 1) name a possible <u>point</u> source of pollution. (0.5 pts)

6. True (T) or False (F): The listed activity helps to reduce pollution from an urban single family lot. Circle the correct response. (2 pts – 0.5 pts each)

Sweep driveway dirt onto the road.	T	F
Wash your car at the car wash.	T	F
Use water-wise plants in your landscaping.	T	F
Direct rooftop runoff to the street drain.	T	F

7. Look around at the houses, lots and streets nearby. Name 2 LID practices that homeowners or the town could use to reduce runoff from their properties. (1 pt – 0.5 pts each)

8. Look at Map1 that shows the storm drains for the town of Pinawa. (1 pt – 0.5 pts each)
   a) Where does storm water in Pinawa end up?

   b) What would be a LID improvement to this situation?

Answer:

1. Pollution that accumulates over a widespread area and enters a waterbody (ref: pg 1). It occurs when rainfall or snowmelt water travels over the ground collecting any natural or man-made pollutants in its path.
2. Point source pollution is pollution that enters a waterway but can be traced to a single location such as a factory or sewage treatment plant.
3a. residential storm water drains
3b. any 2 of, general or specific in brackets: nutrients (fertilizers, septic system effluent); pathogens (pet and wild animal waste, septic systems); sediments (road salts and sand); toxic contaminants (household products, pesticides, herbicides, insecticides); debris (litter, illegal dumping), thermal (heated runoff).
4. One of the following 2 sites and one of the pollutants associated with it.
Site - golf course. Pollutant one of: nutrients (fertilizers), pathogens (pet and wild animal waste), sediment (erosion), toxic contaminants (pesticides, insecticides, herbicides), debris (litter);
Site -marina (commercial). Pollutant one of: nutrients (boat exhaust), pathogens (septic discharge from boats), sediments (construction), toxic contaminants (boat emissions and fluids, oils, gasoline, cleaning solutions), thermal (removal of riverside vegetation during construction).
5. Sewage lagoons or water treatment plant.
6. F, T, T, F

7. Two of: Vegetated rooftops, Rain Gardens, Rain barrels, cisterns, more permeable pavements, reduce amount of asphalt, sizing of lots, streets, curbs, sidewalks, bioretention ponds, vegetated buffer strips, tree preservation, good housekeeping practices.
8a. Winnipeg River 8b.Have the drains empty into a retention pond.

Reference:

Ontario Theme Guide – 1 (pg 14), 2 (pg 1), 3a and b. ref: table 4, pg 15-18 of theme, 4. (ref: Table 4, pg 15-18 and common knowledge to associate pollutant with site), 5. Ref: pg 1, 6. Ref: page 2, 7a (pg 15) 7b pg2, 8 pg3, 9 pg 2 and 8, 10a ref: the map 10b. Ref pg 2 and 3

STOP 11

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Examine the graph on display, which shows two different vertical profiles of water temperature at a 10-metre deep sampling station offshore from Pinawa at two different times of the year, labelled A and B on the graph.

Which season of the year is Season A? _____ (0.5 pts)

Which season of the year is Season B? _____ (0.5 pts)

During a strong wind event, what can happen in the entire water column at the time of the B profile, but not at the time of the A profile? (1 pt)

_____

Answer:
A. summer, B. spring (or fall) (2 x 1/2 pt = 1 pt); The water column can mix from top to bottom. (1 pt)
Reference:
Online Resources for Aquatic Ecology:
Aquatic Ecology Document, pages 6-7
A Primer on Limnology, pages 8-12

FORESTRY (10 points)
EQUIPMENT

1. What is the meaning of the acronym TEK? (1 pt)

   _____

2. How have Aboriginal people historically passed TEK from generation to generation? (1 pt)

   _____

3. TEK can be used by Aboriginal people to create a "map biography" to show the story of a person's life on that land. This stop has a sample map showing TEK information as well as other general information. Based on this map, indicate four (4) samples of information that are most likely examples of TEK. (4 pts)

   _____

_____

_____

_____

4. Nonpoint Source pollution can take place due to forestry activites. Fill in the table below: (4 pts)
   In the first column describe two (2) ways NPS pollution from forestry activities may affect the surrounding ecosystem.
   In the second column, list a TEK from your answers in question 3 that could be affected by NPS pollution listed in column one.

Ways NPS from forestry affects activities	TEK affected by NPS pollution
A.	A.
B.	B.

Answer:

1. *TEK: Traditional Ecological Knowledge*
2. *TEK Passed on through: storytelling, experience, or spiritual practice*
3. *Traplines, spawning grounds ,medicinal plants, migration corridor, spiritual significance, or fishing camp*
4. *A. Can be effect on stream bank and stream bed stability, water quality, fish and wildlife habitat, and other environmental functions.*
   B. Can be traplines, spawning grounds, medicinal plants, or fishing camp as appropriate.

Reference:

Regional training materials, model forest link from resources, Ontario NPS pollution resource (page 27), Chief Kerry's Moose resource, chapter 1 (page 2).

SOILS AND LAND USE (2 points)

A) Maintaining adequate crop residue on fields is important for controlling soil erosion. Which time of year would a potato field be least susceptible to erosion? Circle the correct answer. (1 pt)

a. Early spring
b. July
c. Early October

B) What is the purpose of irrigating a sandy potato field on a windy spring day? (1 pt)

_____

Answer:
A) July; B) Controlling wind erosion and topsoil loss (1 point each)
Reference:
A) Soil Management Guide, page 85; B) Soil Management Guide, page 88.

WILDLIFE (2 points)
EQUIPMENT

A) Identify this species (1 pt)

_____

B) In the area around Pinawa, what kind of weapon can a youth use to hunt this species on Nov 2? (1 pt)

_____

Answer:
a) White Tailed Deer
b) Muzzleloader
Reference:
Hunting guide 2011 (pg 25, 26)
Common Knowledge to ID a White Tailed Deer

THEME: NPS AND LID (2 points)

The mean infiltration rate of compacted soils is 174 mm/hour. Assuming 200 mm of rainfall was received at a uniform rate over the course of one hour, how many litres of water will runoff a 5,000 square metre area?

_____

_____

Answer:
5000 m^2 x 0.026 m = 130m^3 or 130,000 litres
Reference:
Calculation

STOP 12

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Note the piece of equipment on display at this stop.

Where and under what conditions is it designed to sample? (0.5 pts each = 1 pt)

_____

_____

What is it designed to collect? (0.5 pts)

_____

What other kind of sampler might also be used to sample this same habitat? (0.5 pts)

_____

Answer:
Soft bottom sediments (mud) with minimal stones (1/2 pt ea = 1 pt), bottom dwelling (benthic) invertebrates (benthos) (1/2 pt), sediment core sampler (1 pt)
Reference:
Online Resources for Aquatic Ecology:
Aquatic Sampling Techniques, page 5
Possible pre-test training session

FORESTRY (2 points)
EQUIPMENT

The photo shows a picture of the Asian Longhorned Beetle, an invasive species not yet established in Manitoba forests.

A) Name the type of trees that Asian Longhorned Beetle typically targets (0.5pts).

_____

B) How does it harm the tree? (0.5 pts)

_____

C) Name one reason why it is a concern for the Asian Longhorned Beetle to have a population in Canada's forests. (1 pt)

_____

Answer:
A) Broadleaf/deciduous trees, with an emphasis on maple (especially sugar maple) B) Beetle tunnels into healthy trunks and branches, eventually killing the tree. C) Attacks maple trees, including sugar maple which is a principal source of sap for maple syrup (industry worth $100 million annually in Canada), no known natural predators in Canada
Reference:
Alien Forest Pests, Manitoba Envirothon Forestry Document

SOILS AND LAND USE (2 points)

True or false. Circle the correct response. If the statement is false, change it to make it correct.
The bacterium Rhizobium forms an association with roots of legumes which facilitates fixing

potassium from the soil atmosphere. T F

_____

Answer:
False. Nodules formed by Rhizobium fix nitrogen. (1 point each)
Reference:
Microbiology: 6th Edition; Soils Binder

WILDLIFE (2 points)

Identify the two species on the basis of their furs in front of you. Provide two examples of how you use the fur to tell the species apart.

	Species	Example 1	Example 2
Fur A	(0.5 pt)	(0.5 pt)	(0.5 pt)
Fur B	(0.5 pt)		

Answer:
A) Bobcat B) Lynx
Examples – Half black and white tipped tail (BC) Fully Black tipped tail (Lynx), Size (Bobcat Smaller), Ear tufts (Lynx longer), Colour bc- reddish lynx –more greyish
Reference:
Training Session

THEME: NPS AND LID (10 Points)
EQUIPMENT

MAKE SURE TO GATHER THE DATA FROM MAP A, AND USE MAP A AND MAP B TO FILL IN THE % RUNOFF COLUMN IN THE TABLE IN QUESTION 1 AND ANSWER QUESTIONS 2b and 3b. YOU CAN FINISH THE CALCULATIONS LATER IF NEEDED.

Map A shows the area of land in the town of Pinawa (A=) that lies within each grid square on the map, and the % Runoff (color of grid square) for each type of land in town.

1. Using Map A, calculate the average % runoff for the west side (section A) and east side (section B) of the town of Pinawa. Do this by filling in the table below:
    - enter the appropriate % Runoff for each grid square from Map A (1pt for whole column)
    - compute the Weighted Runoff for the last column in the table: area of grid*% runoff of grid (2 pts for whole Column)
    - calculate the average weighted % runoff for each town section: for each section divide the sum of the values in the last column by the total area of the section. (2 pts for final calculation)

Section	**Grid #**	**Area (km^2)**	**% Runoff**	**Weighted Runoff of Grid =Area * % Runoff**
A	1	0.07		
A	2	0.25		
A	3	0.20		
A	4	0.12		
A	5	0.14		
A	6	0.25		
A	7	0.25		
A	8	0.18		
			Average Weighted % Runoff of Section A =	
B	9	0.20		
B	10	0.25		
B	11	0.23		
B	12	0.03		
B	13	0.24		
B	14	0.25		
B	15	0.16		

B	16	0.20		
B	17	0.19		
			Average Weighted % Runoff of Section B =	

2. a) How many times greater is average % runoff in section B than in section A? (1 pt)

_____

b) Look at Map A and B. Why is the % runoff greater in grids 10 and 14 in section B than in grids 6 and 7 in section A? (1 pt)

_____

3. a) If 2 cm of rain fell on the town of Pinawa, how much of the 2 cm would run off in Section A? (2 pts)

_____

b) Look at Map A. Where does the runoff in developed areas of town probably go first? (1 pt)

_____

Answer: *1.*

Section	Grid #	Area (km^2)	% Runoff	Area Weighted Runoff =Area*%Runoff
A	1	0.07	10%	0.7
A	2	0.25	10%	2.5
A	3	0.20	10%	2.0
A	4	0.12	20%	2.4
A	5	0.14	10%	1.4
A	6	0.25	20%	5.0
A	7	0.25	20%	5.0
A	8	0.18	30%	5.4
		Sum=1.46		Sum=24.4
			Average weighted runoff =	24.4/1.46=16.7%
B	9	0.20	20%	4.0
B	10	0.25	40%	10.0
B	11	0.23	30%	6.9
B	12	0.03	20%	0.6
B	13	0.24	30%	7.2
B	14	0.25	40%	10.0
B	15	0.16	20%	3.2
B	16	0.20	20%	4.0
B	17	0.19	30%	5.7
		Sum=1.75		Sum=51.6
			Average weighted runoff =	51.6/1.75=29.5%

2a. there is 0.29.5/16.7= 1.77 times more runoff in B than A.
2b. Grids 10 and 14 in Section B have more impervious surfaces such as roads, commercial buildings, parking lots, etc . Or: There are less permeable surfaces such as trees, lawns, soils, natural ground cover in the grids of section B than A . Or: grids 6 and 7 have a larger proportion of natural ground cover and only partial development.
3 Give full marks if calculation here correct even if values from Q1 are wrong.
*a. Section A: Average runoff A*precip = 16.7%*2cm= 0.167*2=0.334 cm*
3b. Storm drains

Reference:
Ontario Theme Study Guide – Fig 16, pages 15 and 4

STOP 13

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Refer to the laminated figure (provided) showing the five main uses of water in Canada, but with names of the top 4 uses replaced by the letters A, B, C and D.
The missing names are listed below, in alphabetical order. Next to each of these names, place the letter (A, B, C or D) which correctly indicates its usage position on the diagram. (0.5 pts for each correct answer, for a total of 2 pts)

Agriculture _____

Manufacturing _____

Municipal & Rural Domestic Use _____

Thermal Power Generation _____

Answer:
Agriculture D; Manufacturing B; Municipal & Rural Domestic C; Thermal Power Generation A
Reference:
Online resources or Aquatic Ecology:
Water Use, pages 3 and 4
Water Conservation, page 2

FORESTRY (2 points)

Why are Pre-Harvest Surveys performed?

_____

_____

Answer:
Identifies values in an attempt to mitigate impacts of forest management activities on sensitive sites, waterways, wetlands, wildlife and their habitat and conserve biodiversity.
Reference:
pH Surveys/MC Forest Practices Website.

SOILS AND LAND USE (10 points)
EQUIPMENT

Killarney is a town in southwestern Manitoba. You are provided with a map of the Killarney area. On the map, locate the seasonal recreational area on the shore of Killarney Lake.

A) What three different areas, or zones, are located directly across the lake from the seasonal recreational area? (3 pts)

_____

_____

_____

B) Which of the four areas is most sparsely populated during July? (1 pt)

_____

C) List 4 management practices to control runoff of nutrients from the rural farming area into Killarney Lake (4 pts)

_____

_____

_____

_____

D) Soil survey information indicates that the section where the lagoon is located is primarily clay. What is the advantage of this soil texture for lagoon placement? (1 pt)

_____

_____

E) Over time, salinity has developed around many municipal lagoons. How does this happen? (1pt)

_____

_____

Answer:
A) Rural area, rural residential area and urban (Killarney) area. (1 point) B) Rural area. (1 point) C) Possible answers include: Conservation tillage Fencing off of shorelines Off stream watering of livestock Maintaining wetlands Incorporation of fertilizers Maintaining buffer zones along the lake Replanting or maintaining vegetation in buffer areas Rotational grazing to improve pasture health

Fertilizing according to soil test results (4 points - 1 point each); D) Clay soils have a low infiltration rate, and will keep the effluent from seeping out. (1 point); E) The effluent has seeped out of the lagoon, bringing soil salts to the surface as well as the salts from the effluent. (1 point).

Reference:

A) Use map to deduce answer.
B) Use map to deduce answer.
C) General knowledge.
D) Soil Management Guide, p. 46.
E) Soil Management Guide, pp. 63-65.

WILDLIFE (2 points)

A) Define invasive species. Describe one advantage they have over native species (1 pt)

_____

_____

B) List two (2) invasive plant species found in Manitoba (0.5 pts each)

_____

_____

Answer:

a) Invasive species are plants, animals or other organisms that are growing out of their country or region of origin and are outcompeting or even replacing native organisms.
One of the following: Invasive species tend to be aggressive and reproduce at a high rate, they have no predators, parasites or diseases in their new location, they have no natural checks and balances

b) Purple Loosestrife, Leafy Spurgre, Nodding Thistle, Flowering Rush, Himalayan Balsam, European Buckthorn, Common Tansy, Common burdock, Yellow flag iris, Curly leaf pondweed, Reed canary grass, Invasive Phragmites, European frog-bit, Eurasian watermilfoil, Salt cedar, Hydrilla

Reference:

Invasive Species of MB Page 2

THEME: NPS AND LID (2 points)

List two ways wildlife can be used as indicators to detect NPS pollution in an ecosystem.

_____

_____

Answer:

1. By analysing factors such as species presence 2. Absence of species 3. Population abundance 4. Diversity both within and among species

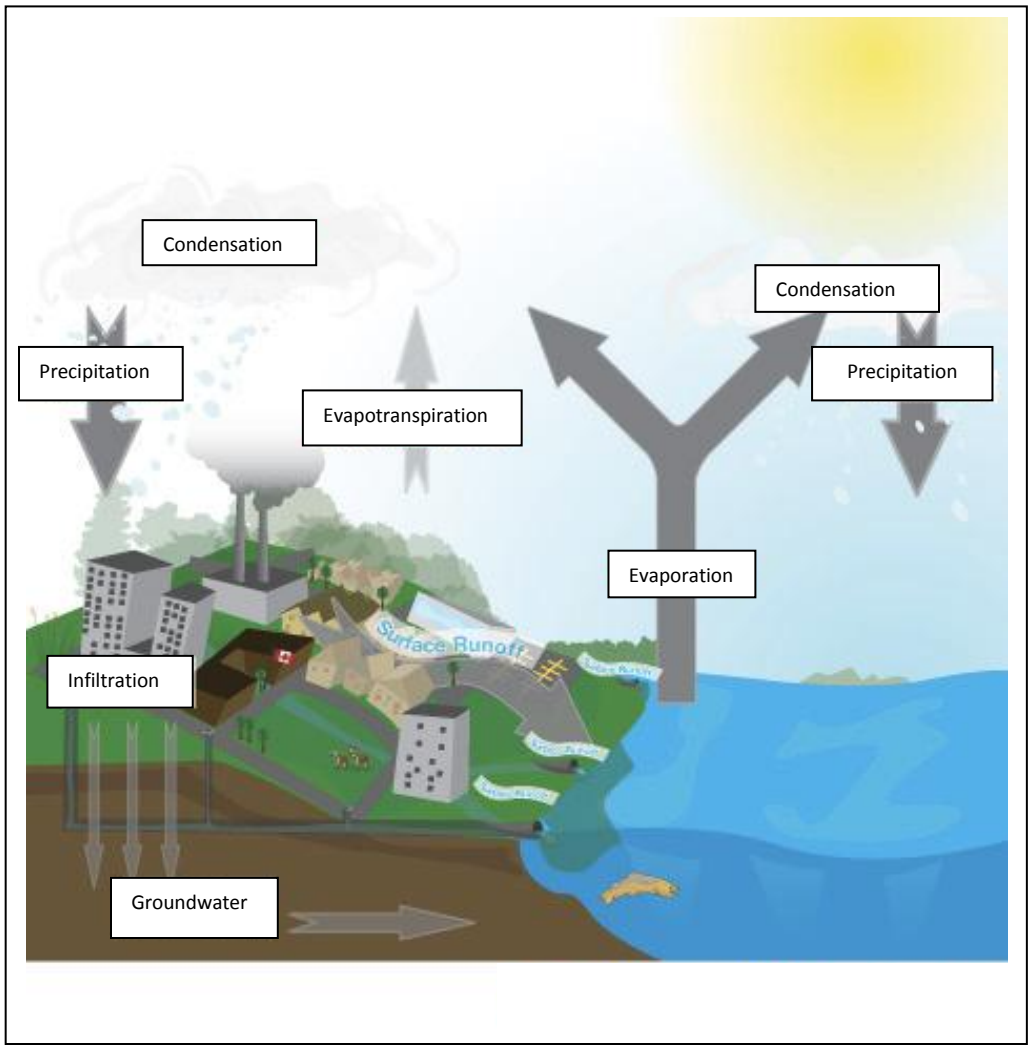
Reference:

Envirothon Study Guide 2012 – NPS Ontario, pgs 42

STOP 14

AQUATIC ECOLOGY (2 points)

On the diagram circle the two main areas of the hydrologic cycle that low impact developments aim to increase in order to manage stormwater runoff.
(2 points - 1 point each)



Answer:
Infiltration and Evapotranspiration. Will accept surface runoff if circled.

Reference:
Theme Study Guide: page 2

FORESTRY (2 points)

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

1) _____

2) _____

Answer:
Longer growing season, increased growth due to increased CO_2, changes to precipitation patterns, increased efficiency of water use in plants,
Reference:
Event Training, From What Trees can do…

SOILS AND LAND USE (2 points)

A) Match the term to the mode of deposition. (0.5 pts each)

Deposited by glacier_____
Deposited by wind _____
Deposited by river or stream _____
Deposited by a lake _____

Choose from the following:

a.organic
b. outwash
c. fluvial
d. eolian
e. till
f. lacustrine

Answer:
A) Till; B) Eolian (1 point each)
Reference:
A) Soil Management Guide, page 8.

WILDLIFE (10 points)
EQUIPMENT

Examine the campsite at this stop.

1. Identify four (4) things that you see in this campsite that could attract bears. (4 pts)

_____

_____

_____

_____

2. Explain three (3) ways the campers can make this campsite appropriate for bear safety (3 pts)

_____

_____

_____

3. Using *Tracking and The Art of Seeing*, identify the two wildlife species that have already been in the campsite (2 pts)
   a. _____
   b. _____

4. A black bear has entered your campsite. It is on its hind legs and scenting the air. What should you do? (1 pt)

_____

Answer:
1. *Chips in tent, minnows, dish water, perfume, garbage, dirty dishes*
2. *Full points if they describe ways to rectify the attractants*
3. *A) Skunk B) Raccoon*
4. *Any two of: Make loud noises and scare the bear away, stand tall, arms up.*

Reference:
Be Bear Smart
Campsite Bear Smart
Animal tracks of MB: Racoon and Skunk Tracks

THEME: NPS AND LID (2 points)

What is the term for the situation in which NPS affects an egg before it is laid by a female eagle, potentially causing birth defects?

_____

What is the term for the build up of toxins in predators over the long term that can cause health issues and birth defects?

_____

Answer:
1. Vertical transmission 2. Bioaccumulation

Reference:
Envirothon Study Guide 2012 – NPS Ontario, pgs 43, 44

STOP 15

AQUATIC ECOLOGY (2 points)
EQUIPMENT

Examine the sheet containing photomicrographs of three species of photosynthetic plankton found in freshwater lakes. There are seven major taxonomic groups of algae (Diatoms, Chlorophytes, Euglenophytes, Dinoflagellates, Chrysophytes, Phaeophytes, Cyanobacteria) occurring in freshwater.

Beside the name of each species, list the taxonomic group to which it belongs: (0.5 pts each = 1.5 pts)

Dinobryon _____

Asterionella _____

Anabaena _____

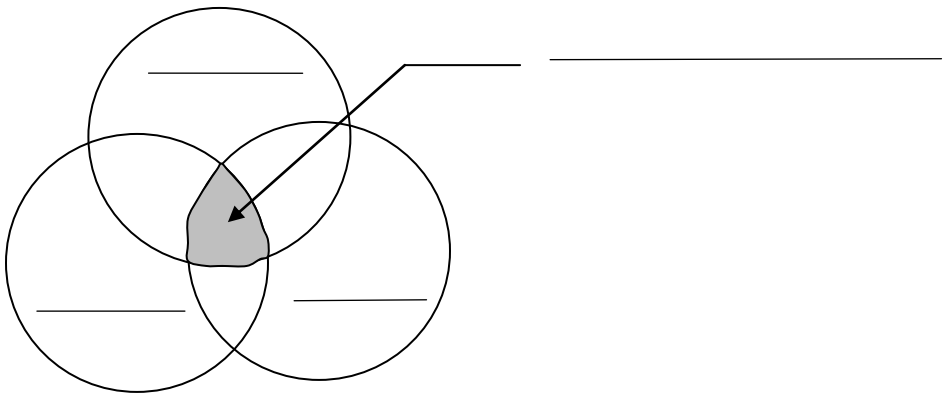
Which of these species is particularly adapted to forming blooms in warm, nutrient rich lake water? (0.5 pts)

_____

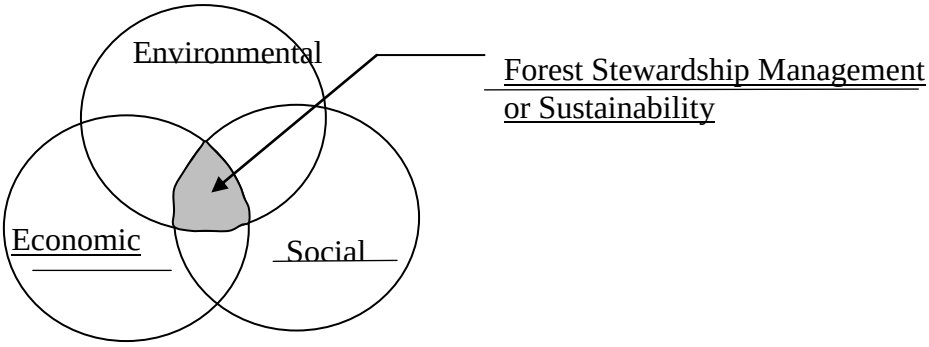
Answer:
Dinobryon - Chrysophytes, Asterionella - Diatoms, Anabaena - Cyanobacteria, Anabaena (Cyanobacteria).
Reference:
Online Resources for Aquatic Ecology:
Freshwater Productivity, pages 1-4
A Primer on Limnology, pages 26-29

FORESTRY (2 points)

Label the Forest Stewardship Management diagram. (2 points – 0.5 each)



Answer:



Reference:
Forestry Training

SOILS AND LAND USE (10 points)
EQUIPMENT

Using the 'Soils of the Rural Municipality of North Norfolk' report and maps provided, answer the following questions:

1) At what scale was the area surveyed or mapped? (2 pts)

_____

2) How many townships are found in the Rural Municipality of North Norfolk? (2 pts)

_____

3) What are the four phases of soil properties that are indicated by the map unit? (2 pts)

_____

4) Look at Table 5. Agricultural Capability Classes for Soils, what is the agricultural capability class for the Ramada soil? What is its limitation? (2 pts)

_____

5) Look at Soil Map Sheet 1, what is the dominant map unit found in NE 04-10-09W (2 pts).

_____

Answer:
All answers are found in the 1) 1:20,000 to receive 2 points; if the students say detailed only 1 point is awarded. 2) 12 townships (2 points) 3) The four soil phases are: erosion, slope class, stoniness, salinity (0.5 point each). 4) Ramada has an agricultural capability rating of 1 (1point). Class 1 soils have no limitations (1 point). 5) SUE (8)-LOP (2) (2 points)

Reference:
Manitoba Detailed Soils Report D80 - Soils of the Rural Municipality of North Norfolk.

WILDLIFE (2 points)
EQUIPMENT

Looking at the tracks in front of you, a predator is stalking its prey. Identify the Predator (A) and Prey (B) species.

A) _____

B) _____

Answer:
A) *Grey Wolf* *B) White Tailed Deer*
Reference:
Animal Tracks of Manitoba Guide Sheets

THEME: NPS AND LID (2 points)

Low impact development practices can help reduce the negative impacts of nonpoint source pollution in soils by limiting _____ and _____.

Answer:
Sedimentation and percolation of effluent and excess nutrients.
Reference:
Ontario Theme Document, page 37.