



## Tutorial

Tutorial Questions are divided into three sections: Forest Floor, Humus Forms and Multiple Choice. Answering the questions in these tutorials will help you to explore the website, which in turn will be useful to completing your forest floor laboratory assignment.

### FOREST FLOOR

1. In what types of locations will O horizons be found? Would you expect to find O horizons at UBC? Why or why not?

O horizons are found under poorly drained conditions, where the forest floor is saturated for some period of time each year such as in wetlands. Don't expect to see them on campus!

2. List 3 ways the forest floor influences soil properties. *View the definitions page and the "In the Ecosystem" video.*
  - The forest floor retains moisture in the soil
  - Causes more stable soil temperatures (less variation)
  - Habitat to majority of soil organisms in forests
  - Important in soil nutrient cycles – many nutrients are stored in the forest floor
  - Organic matter can enhance soil structure and reduce bulk density
3. List three properties of litter that will influence what type of decomposer communities will be present in a sample. *Part 3 of the "Humus Form Orders" videos gives a good overview of this.*
  - C:N ratio
  - Nutrient content
  - pH
  - Compounds such as lignin which can be difficult for decomposers to break down
4. Describe the typical structure of an Fm horizon, an Fz horizon. *See the Classification – Description page for explanations of how to assess structure and other properties of organic horizons.*



Fm: Compact-Matted Structure, due to the abundance of roots and fungal mycelia that hold the organic horizons together in a “carpet-like” way.

Fz: granular structure arising from passage of material through faunal guts creating castes.

5. What is meant by the Character of an organic horizon? What would you expect to be the character of an H horizon? *Big hint around 1:54 of the “Organic Horizons” video. Keep watching to answer question 6.*

Character is the tactility of the material – or more simply: how it feels. In the case of an H horizon, the character is often greasy and stains the fingers.

6. In what range does the organic matter content in an organic horizon fall? (By mass).

Between 30-100% organic matter, or greater than 17% carbon by mass.

7. Name any flora or fauna you would expect to see in an Fm horizon, in an Fa horizon? How will this affect properties of the forest floor?

Fm: fungi

Fa: fungi, earthworms and/or other macrofauna, meso and micro fauna can be visible under a microscope

8. Where would you expect the thickest forest floors to form? The thinnest? Why is this so? *See Forest Floor Definition.*

Thickest: in cold climates such as the boreal forest, where decomposition and nutrient cycling is very slow – thick organic deposits known as peat can form.

Thinnest: in tropical forests. Decomposition and nutrient cycling are very rapid.

9. What differentiates the forest floor from mineral soil?

The amount of organic material. Organic matter must make up at least 30% of the mass of a horizon for it to be classified as an organic horizon.

10. Organic Horizons:

- a. Aide in water retention



- b. Provide Nitrogen, Phosphorus and Sulfur among other nutrients to plants and microbial communities
- c. Store carbon
- d. May indicate ecological conditions or changes
- e. All of the above
- f. a, b and c

## HUMUS FORMS

1. Review the following incomplete Humus Form Descriptions. Determine the type of F horizon (Fm, Fz, Fa) and Humus Form Order (Mor, Moder, Mull) for each description.
  - a. (form a) Fa, Moder
  - b. (form b) Fm, Mor
  - c. (form c) Fz, Mull
2. What are the characteristic horizons of each of the Humus Form Orders?  
Mor: Fm  
Moder: Fz or Fa  
Mull: Ah
3. Describe the typical F horizons (if present) of each Humus Form Order. *See the Organic Horizons Page.*  
Fm: Dominated by fungal decomposition, matted structure due to abundant mycelia and roots, fauna are uncommon  
Fz: Fauna are abundant (including faunal castes), bacterial decomposition is most important, material is loose and often granular in structure  
Fa: Has properties of both the Fm and Fz horizons: some faunal activity, some fungal hyphae present – typical of mormoders
4. View the following video sections: Humus Forms Part 2 (1:21-3:00) and How to Sample (1:12-1:16). Visually compare the humus forms. The mull described in the “Humus Forms” video was sampled nearby but is somewhat dissimilar to the sample taken in “How to Sample.” In fact one of the samples may not be a mull, but a type of moder called mullmoder. Which sample is it and how is a mullmoder different from a mull? *What are the characteristic horizons of each?*  
The humus form in “How to Sample” may be a mullmoder. A mullmoder *must* have an Fz horizon, whereas a mull may or may not have an F horizon at all, as in the mull sample viewed in the “Humus Forms” video. If a sample has an



Fz horizon, it depends on the thickness relative to other horizons whether it is a mull or mullmoder (see the key on the humus form order page).

5. Name the mineral horizon that appears on the Horizons page. Why is this horizon included?

The Ah is included because it is necessary to include the Ah in humus form descriptions – the influence of organic matter defines the Ah horizon.

6. Describe the typical colour and structure of this horizon.

The Ah tends to be dark in colour due to the incorporation of organic matter. It often has a granular structure due to the passing of material through faunal guts, and the structure promoting factor of relatively high organic matter content.

7. In what range does the organic matter content of this horizons fall? (By mass).

0-30% OM, 0-17% Carbon

#### MULTIPLE CHOICE

1. The difference between O horizons and L,F, and H horizons is:

- a. Organic matter content
- b. Type of vegetation that is source of these horizons
- c. Colour and structure

2. Non conforming materials include:

- a. B and C horizons
- b. Material that has undergone disturbance
- c. Charcoal, wood and coarse mineral fragments
- d. Materials with unusual texture and structure

3. The characteristic horizon of a Mull humus form is:

- a. Fm
- b. Fz
- c. Ah
- d. Hh

4. Fa horizons may be found in which humus form order?

- a. Mor
- b. Moder
- c. Mull
- d. Forest Floor



5. The F in F horizon stands for:
    - a. Ferrous
    - b. Fibric
    - c. Fermented
    - d. b and c
  
  6. Organic Horizons:
    - a. Aide in water retention
    - b. Provide Nitrogen, Phosphorus and Sulfur among other nutrients to plants and microbial communities
    - c. Store carbon
    - d. May indicate ecological conditions or changes
    - e. All of the above
    - f. a, b and c
  
  7. Within which humus form order does the profile in this image fall? (attach)
    - a. Mor
    - b. Moder
    - c. Mull
    - d. Folisol (mentioned at <http://forestfloor.soilweb.ca/definitions/folisols/> )  
Th image shown at <http://forestfloor.soilweb.ca/definitions/folisols/> is indeed a Folisol; however, a Folisol is a type of *Organic soil* rather than a humus form order. If classified as a humus form, this is a mor.
- Refer to the attached humus form descriptions from Humus Forms question 1 to answer questions 8 and 9.*
8. Which combination of soil fauna appeared the Ah horizon of Description (b)?
    - a. Termites, centipedes and ants
    - b. Nematodes, fly larvae and mites
    - c. Spiders, earthworms and beetles
  
  9. Which of the three descriptions indicates having the greatest root abundance? a, b or c?
  
  10. In what answer shown below are horizons listed in order from most to least decomposed?
    - a. L,F,H
    - b. Ah, H
    - c. H,F,L
    - d. Fm,Fz,Fa