3.4.2 Compare and contrast the structure and properties of sand, clay and loam soils, including their effect on primary productivity.

Task: Soil Structure & Soil Properties

(in class)

1. Read the handouts and highlight important points.
2. Fill-in the “Soil Properties Table” with as much information as possible from the reading.

It’s not straight forward, so read through carefully!

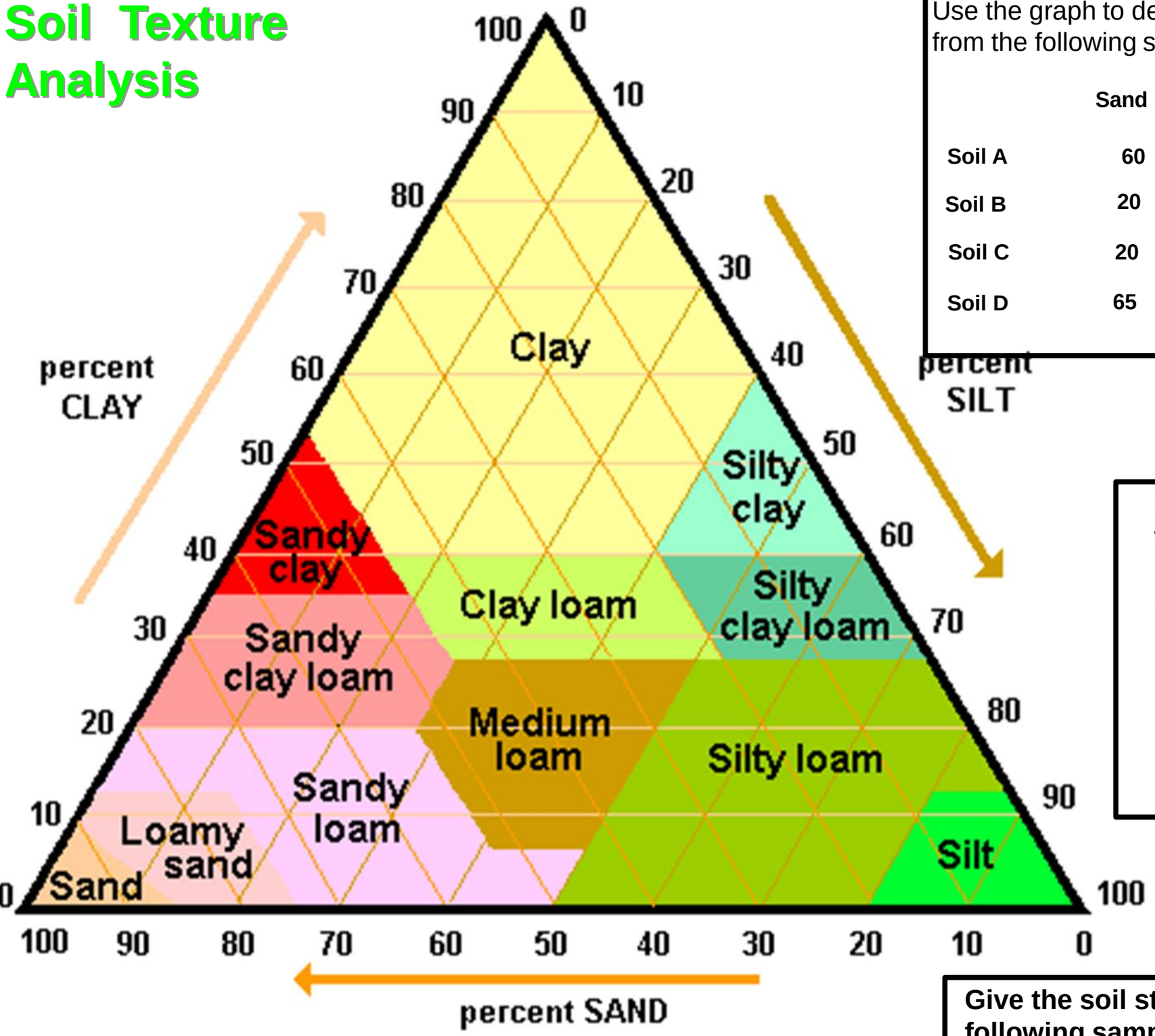
Soil texture

The mineral portion of soil can be divided up into three particles based on size: sand, silt and clay. Most soils consist of a mixture of these soil particles and the soil texture therefore depends on the relative proportions of sand, silt and clay particles.

http://www.youtube.com/watch?v=knrmCbctGEA&feature=PlayList&p=E8FBD429D64D3515&index=1

Learn all about soil texture and how to test for clay, silt and sand

Soil Texture Analysis



Use the graph to determine the soil texture class from the following soil samples:

	Sand	Silt	Clay	Soil texture class
Soil A	60	30	10	
Soil B	20	20	60	
Soil C	20	60	20	
Soil D	65	20	15	

Plot the following soil samples onto the graph:

Sample	sand	Silt	Clay
H	13	26	61
I	60	7	33
J	13	79	8
K	90	5	5
L	30	36	34

Give the soil structure breakdown (%) for each of the following samples:

	sand	silt	clay
E			
F			
G			

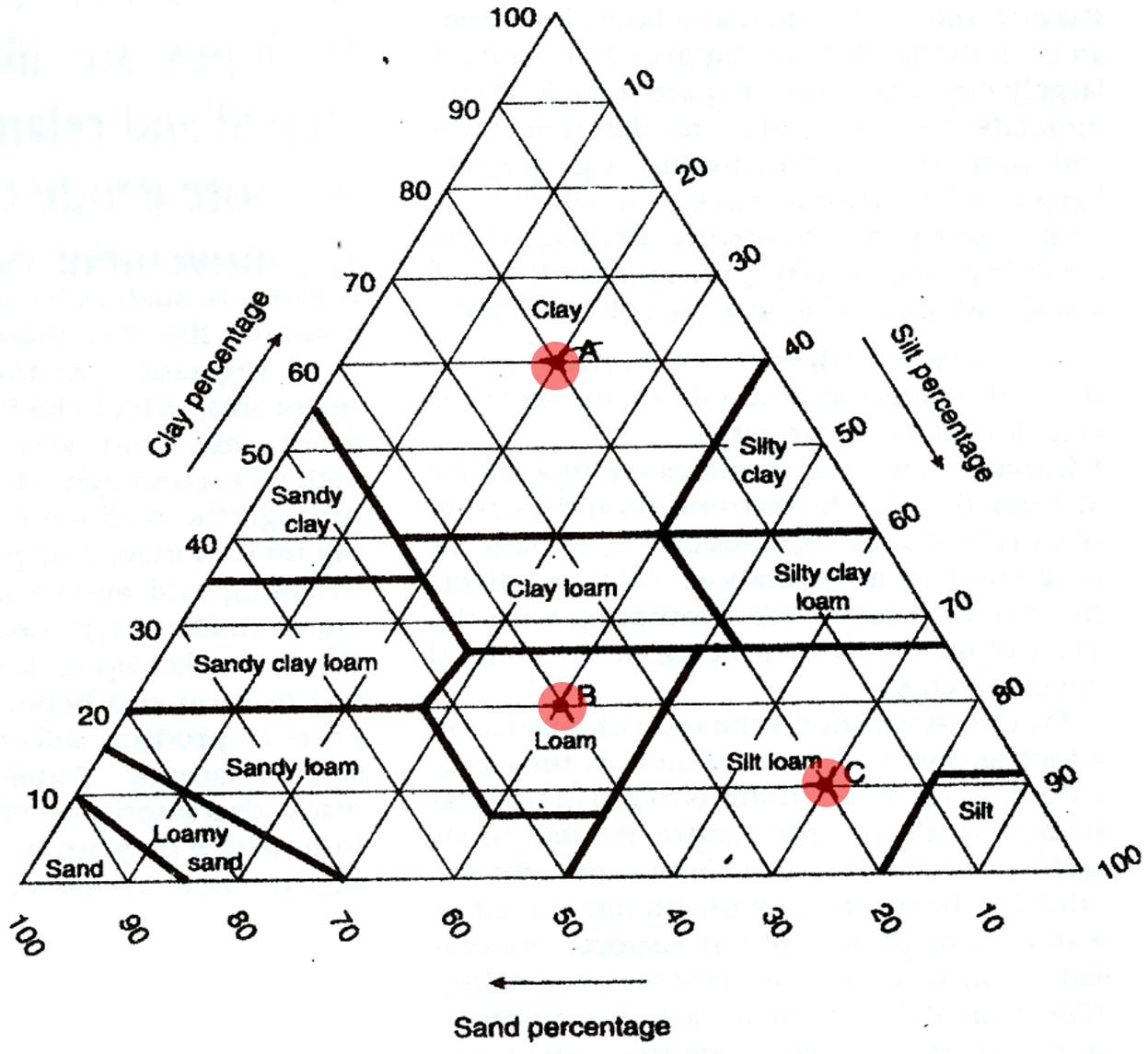
Review Questions:

1. Refer to the triangular graph and extrapolate the percentages of silt, sand and clay for the following soil samples:

	% sand	%silt	%clay
Soil A			
Soil B			
Soil C			

2. Plot the soil textures onto the triangular graph.

Sample	Clay (%)	Silt (%)	Sand (%)
d	61	-26	13
e	33	7	60
f	–8	79	13
g	5	5	90
h	34	36	30



3. Soil structure can be judged in the field by "feel". Match **sand, silt** and **clay** with the following statements:

_____ - a gritty feel; when rubbed, does not form a ball or leave film on fingers

_____ - smooth, silky or soapy feel

_____ - Plastic and sticky when wet; gives a polished surface when rubbed; rolls into a ball

More Review Questions:

- Explain what happens to soils when precipitation exceeds evapotranspiration? (4)

- Describe what happens to the soil system when leaching occurs. (5)

- Extend your thinking: How can having knowledge and understanding of soil properties help farmers to plan their management of the land? (10)

Soil Properties and Slope

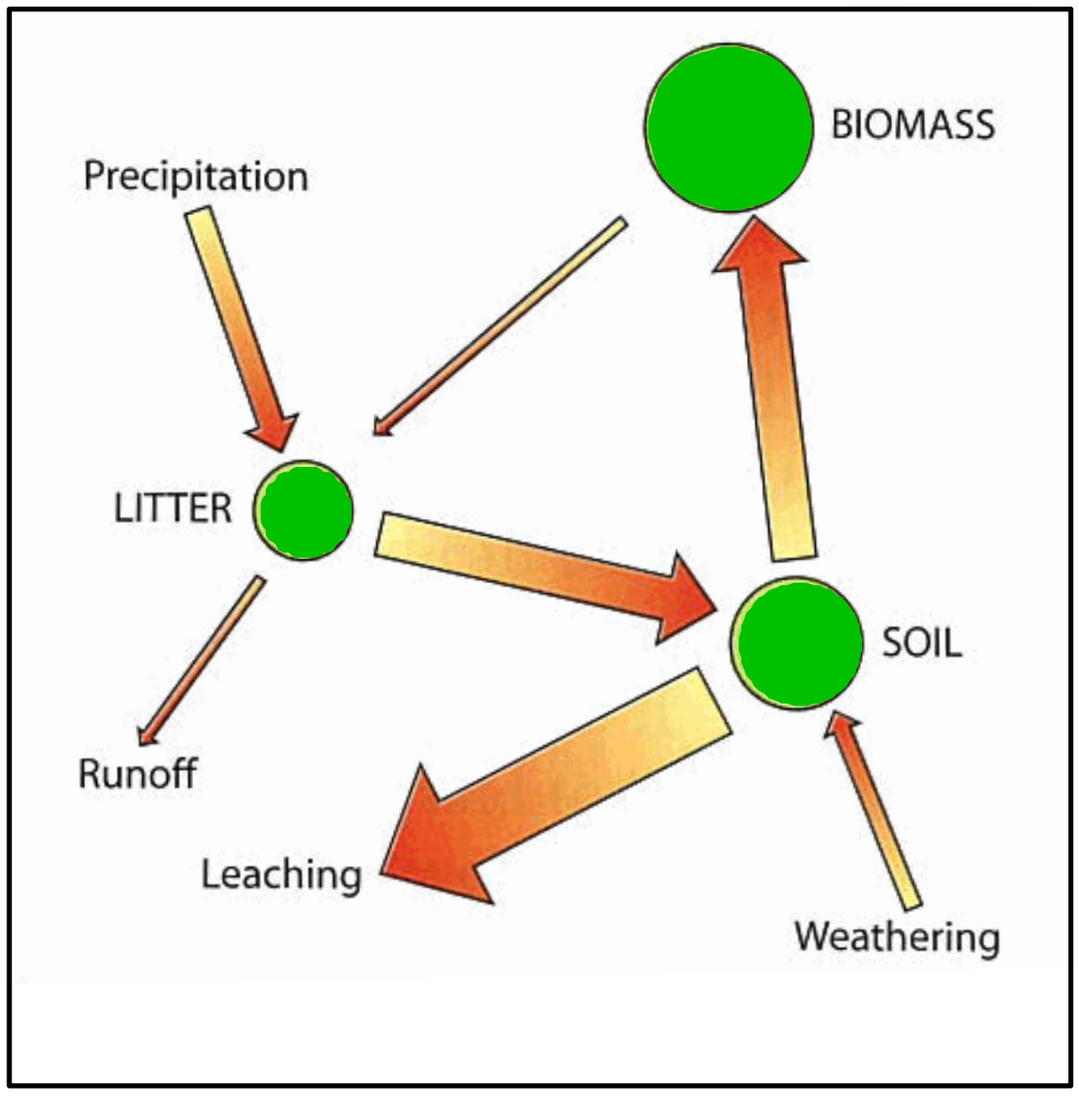
In a downward slope direction, the following properties generally increase:

- Depth of O horizon
- Depth of the A horizon
- Percent clay in the B horizons
- Soil moisture
- pH
- Soil nutrients

Nutrient cycling and Gersmehl's nutrient flow model

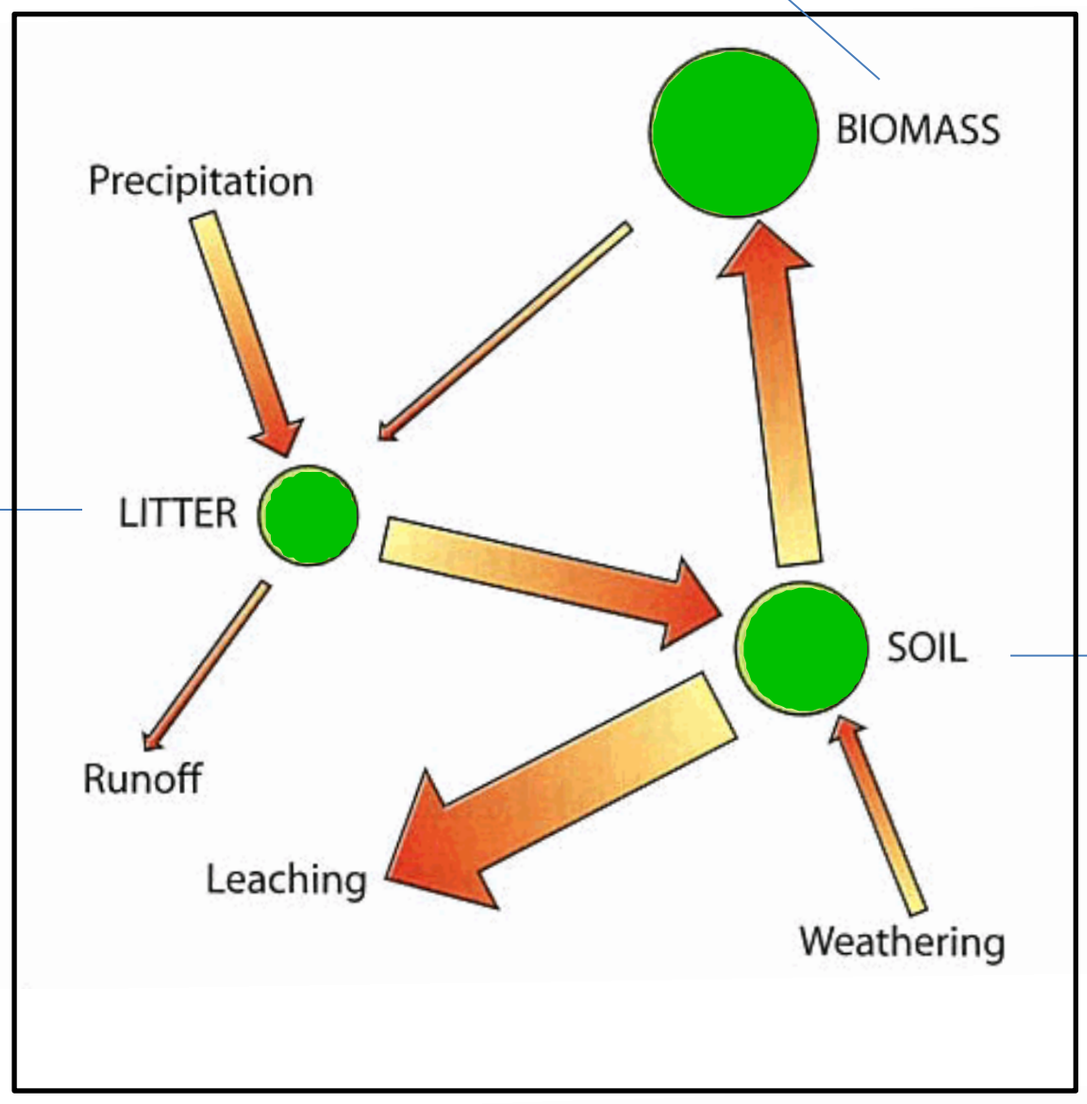
Soil nutrient models in ecosystems

Course Companion p. 230



What do the proportion arrows and the circles represent?

The biomass circle represents nutrients stored in the forest vegetation and animal life.



What do the proportion arrows and circles represent?

The litter circle represents the nutrients trapped in fallen leaves and dead organisms.

The soil circle represents the nutrients present in soil humus, i.e. decomposing leaves and other dead organisms.

Task: Course Companion

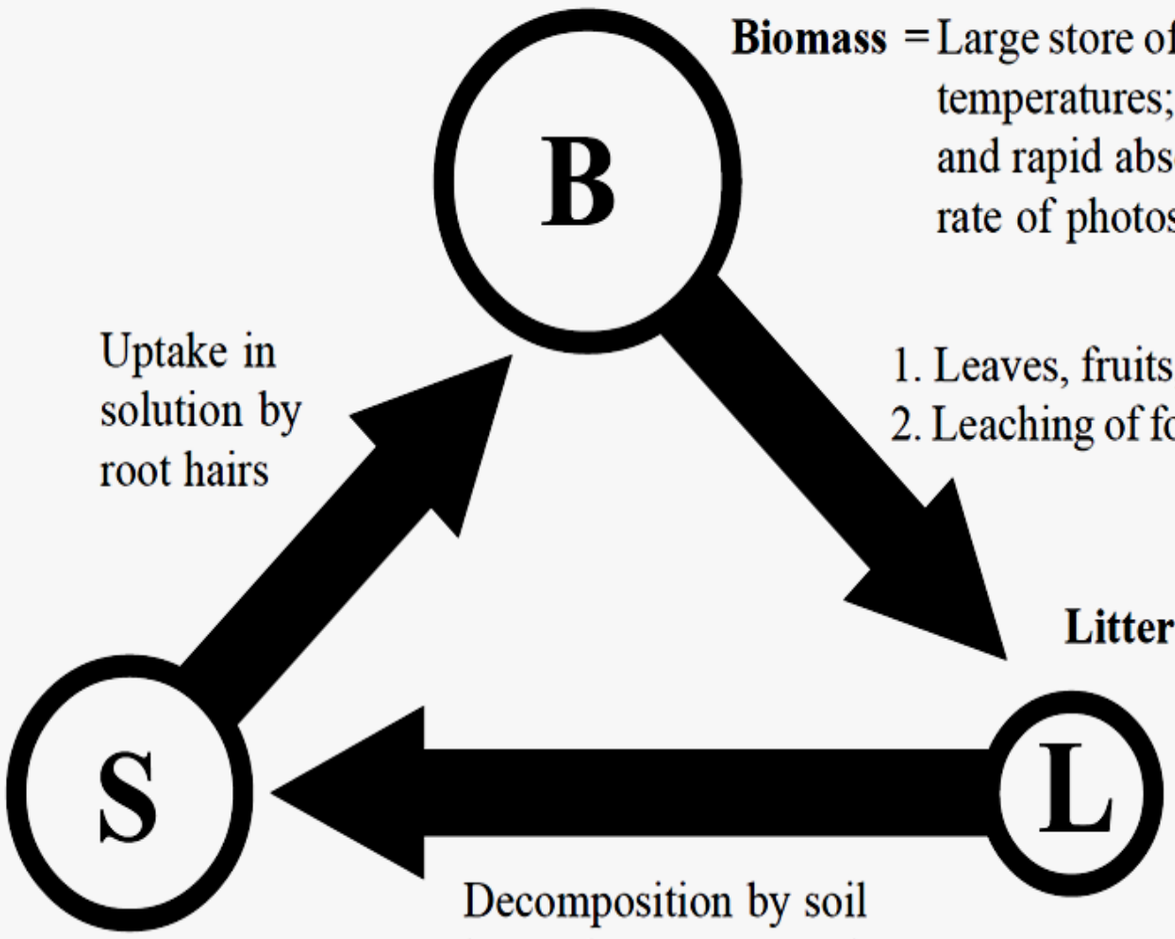
Read p. 230 (blue frame)

Complete “Review” p.239 & 240 Qs 1, 2 &3

Making connections – an exemplar of a Gersmehl model (tropical forest) analysis with justification…

Soil = Smaller store of nutrients than Biomass because:

1. Rapid absorption by dense network of shallow roots. Most trees have symbiotic fungi which accelerate the uptake of nutrients such as phosphorus
2. High rainfall encourages leaching
3. High rates of transpiration mean that water, hence nutrients are rapidly reabsorbed to replace that lost through the stomata



Biomass = Large store of nutrients because high temperatures; high rainfall, long growing season and rapid absorption from soil means that the rate of photosynthesis, hence productivity is high.

1. Leaves, fruits, flowers, twigs falling to the forest floor
2. Leaching of foliage and frass washings

Litter = Small store of nutrients because high temperatures and moisture levels result in very fast decomposition by soil fauna. Nutrients are therefore rapidly transferred from Litter to Soil.