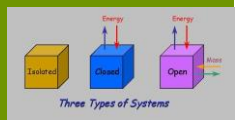
Option C
Ecology and Conservation
C.2- Communities and Ecosystems

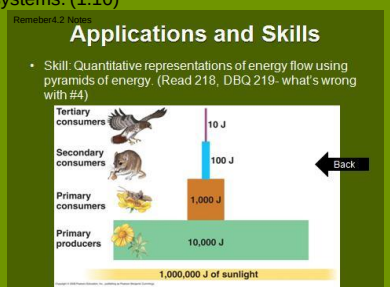


Essential idea:

- Changes in community structure affect and are affected by organisms.

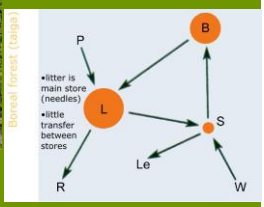
Nature of science:

- Use models as representations of the real world
  - pyramids of energy model the energy flow through ecosystems. (1.10)



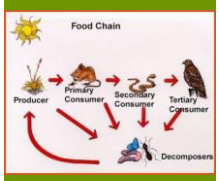
Theory of knowledge:

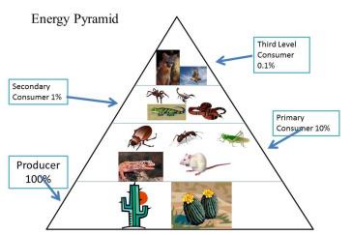
- Do the entities in scientists' models, for example trophic levels or Gersmehl diagrams, actually exist, or are they primarily useful inventions for predicting and explaining the natural world?



Understandings

- Most species occupy different trophic levels in multiple food chains.
  - Hawk could be a secondary consumer.
  - Need to state the trophic level by the food chain an organism is a part of.

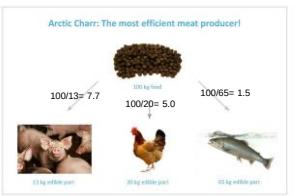




Applications and Skills

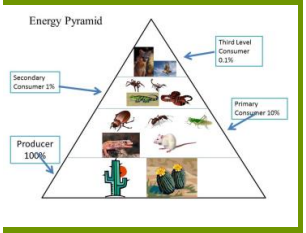
- Application: Conversion ratio in sustainable food production practices. (pg 616)
  - Feed conversion ratios = quantity of food (g) required to produce body mass (3.5 = 350g to produce 100g)
  - What are the conversion ratios for the pig, chicken and fish in the picture?

Meat Production	Feed Conversion Ratio Estimate
Salmon	1.2
Beef	8.8
Pork	5.9
Chicken	1.9



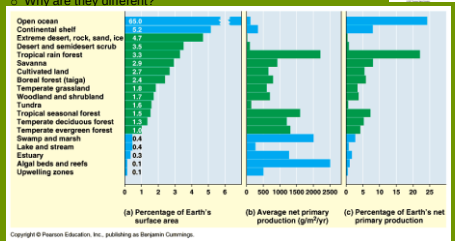
Understandings

- A food web shows all the possible food chains in a community.
  - Activity pg 615: Build a food web.



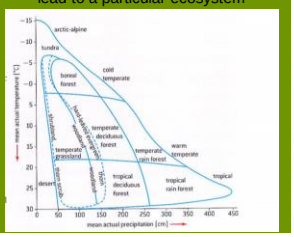
Understandings

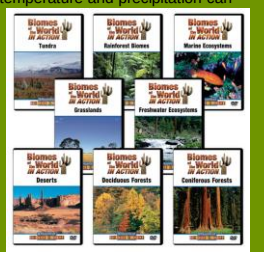
- The percentage of ingested energy converted to biomass is dependent on the respiration rate. (DBQ 622)
  - Net production = Gross production – Respiration
    - What ecosystem has the highest NPP?
    - What ecosystem provides the planet with the highest NPP?
    - Why are they different?



Understandings

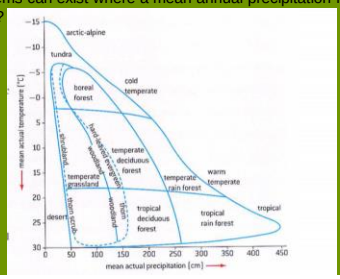
- The type of stable ecosystem that will emerge in an area is predictable based on climate.
  - Biomes are the results of predictable climates
  - Temperature and Precipitation combinations create biomes
  - Whittaker Climographs predict how temperature and precipitation can lead to a particular ecosystem





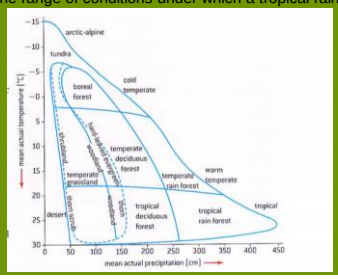
Applications and Skills

- Skill: Analysis of a climograph showing the relationship between temperature, rainfall and the type of ecosystem. (Practice from pg. 617)
  - What ecosystems can exist where a mean annual precipitation level of 175 cm exists?



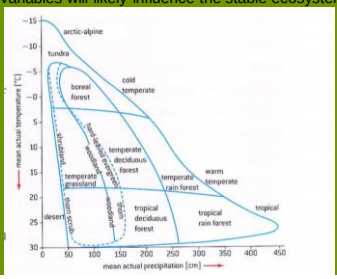
Applications and Skills

- Skill: Analysis of a climograph showing the relationship between temperature, rainfall and the type of ecosystem. (Practice from pg. 617)
  - What are the range of conditions under which a tropical rainforest will form?



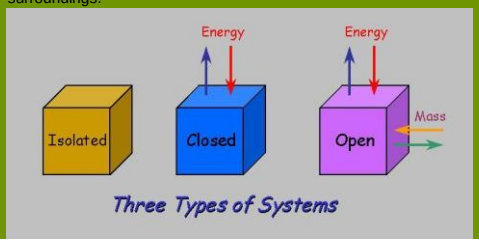
Applications and Skills

- Skill: Analysis of a climograph showing the relationship between temperature, rainfall and the type of ecosystem. (Practice from pg. 617)
  - What other variables will likely influence the stable ecosystem that forms?



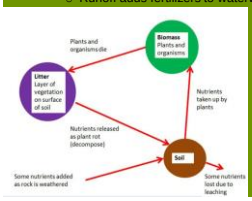
Understandings

- In closed ecosystems energy but not matter is exchanged with the surroundings.
  - Open systems exchange matter and energy with surroundings.
  - Closed systems exchange energy but not matter with surroundings.
  - Isolated systems (theoretical) do not exchange energy or matter with surroundings.



Applications and Skills

- Application: Consideration of one example of how humans interfere with nutrient cycling.
  - Humans can accelerate nutrient flows
  - Agriculture
    - Increased biomass removed
    - Nutrients in soil are depleted
    - Excess water precipitates salts
    - Runoff adds fertilizers to waterways (eutrophication)



Understandings

- Disturbance influences the structure and rate of change within ecosystems.

Applications and Skills

- Skill: Analysis of data showing primary succession. (DBQ 621)
  - Glacier Bay Alaska (data since 1794)
    - Bacteria, lichens, and moss
    - Mountain avens (flowering shrub)
    - Deciduous alder trees
    - Spruce and Hemlock forests

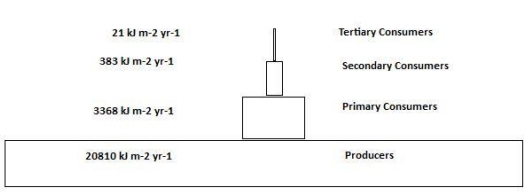
Applications and Skills

- Skill: Investigation into the effect of an environmental disturbance on an ecosystem. (pg 623)
  - Species Diversity
  - Stem Density
  - Above Ground Biomass
  - Leaf Area Index
  - Volume of Leaf Litter
  - Water cycle variables including infiltration rates and run-off rates.
  - Soil variables including soil structure, soil moisture, soil nutrient levels and compaction levels.
  - Light Levels
  - Bulk Soil Density

End

Pyramids of Energy

- Bars are horizontal and to scale
- Every bar is labeled and units indicated (kJ $m^{-2}year^{-1}$)



Applications and Skills

- Skill: Comparison of pyramids of energy from different ecosystems. (DBQ 616 and Activity pg. 618)
  - Compare upweling, coastal, and open ocean.
  - Cedar Bog Lake (MN) and Lake Mendota (WI)

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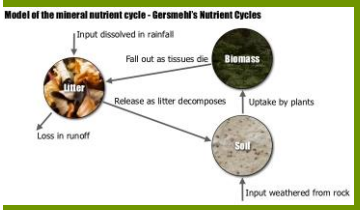
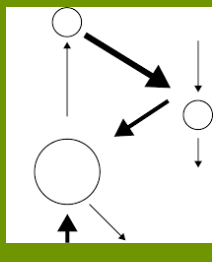
Gersmehl Diagrams

- Stores are drawn as proportional circles representing biomass, litter and soil.
- Nutrient transfers are shown as arrows whose thickness represents the relative rate of flow between stores.





Applications and Skills

- Skill: Construction of Gersmehl diagrams to show the inter-relationships between nutrient stores and flows between taiga, desert and tropical rainforest. (Top Activity pg. 620)

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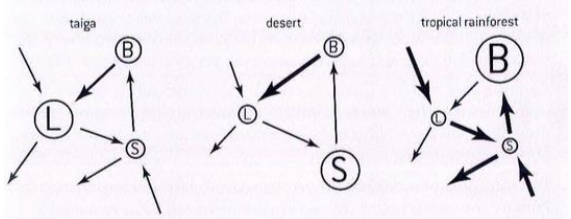
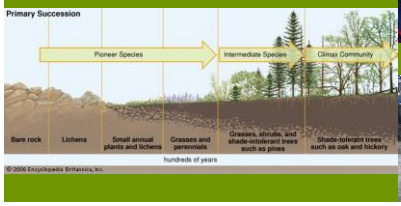


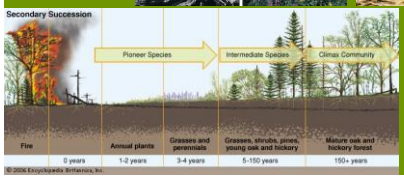
Succession

- Ecological succession are the changes to an ecosystem over time.
- Primary succession starts with bare rock (no soil)
  - Volcanic eruption
  - Glacial retreat



Succession

- Secondary succession starts with a disturbance (but soil remains).
  - Fire
  - Farming



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