



spm 9550: System Nestedness

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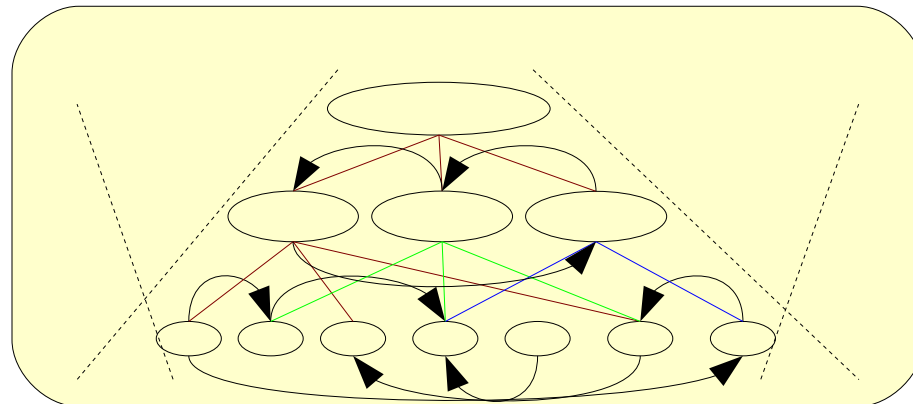
12-03-10

Lecture goals

- Understand the difference between vertical and horizontal nestedness
 - Vertical nestedness vs Horizontal nestedness
- Understand that a system can be a context for another system.

Vertical nestedness

- Complex systems have an elaborate hierarchical organization
 - Upper levels constrain the actions of the lower levels.
 - Low level system components provide all the possible behaviors that a system can have.



Space of possible interactions

- “TheSpaceOfPossible”
- The entire Genetic diversity, within a population.
- All the possible things 40 human beings could do to each other.
- By participating in the wiki lecture, we are creating opportunity to share ideas.

Constraining of lower levels intraaction

- This is where Downward Causation kicks in.
- Living beings consist of a finite number of chemical reactions.
- Because this is a actual lecture, you could not sell beer at it.

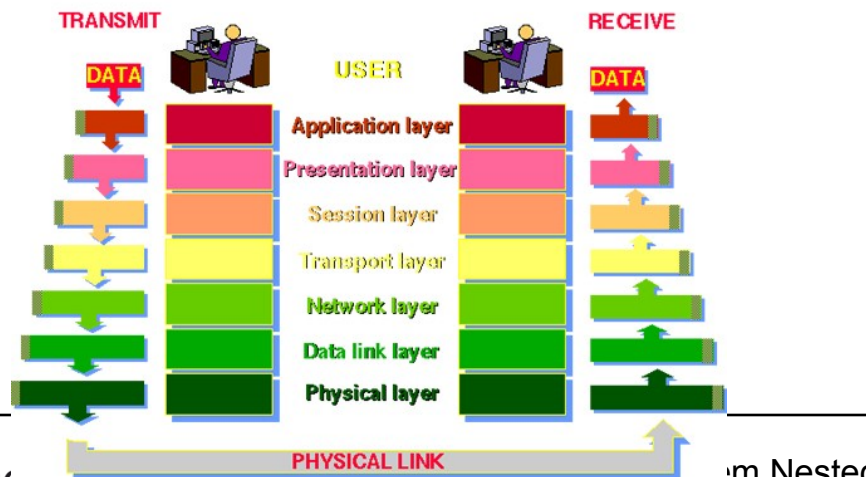
Vertical nestedness

- Systems (holons) in systems
- Higher levels of system aggregation set the boundaries to behavior.
- This creates an interlocking limitations between the levels that determine the overall system behavior.

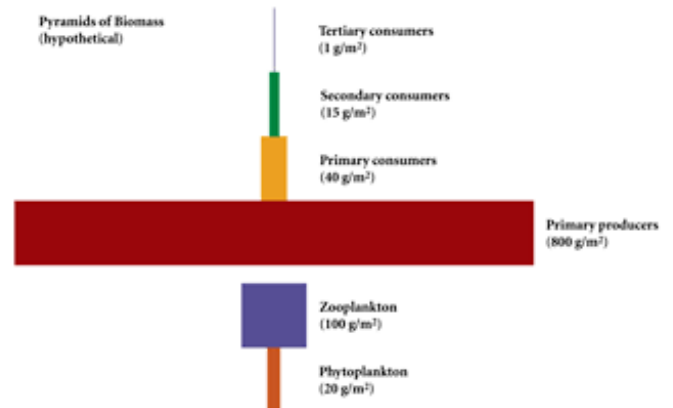
Vertical Context Dependency

- trophic levels of food webs (grass / grazers / predators / humans)
- the Internet (cables / protocols / data / music sharing / RIAA lawsuits)

THE 7 LAYERS OF OSI

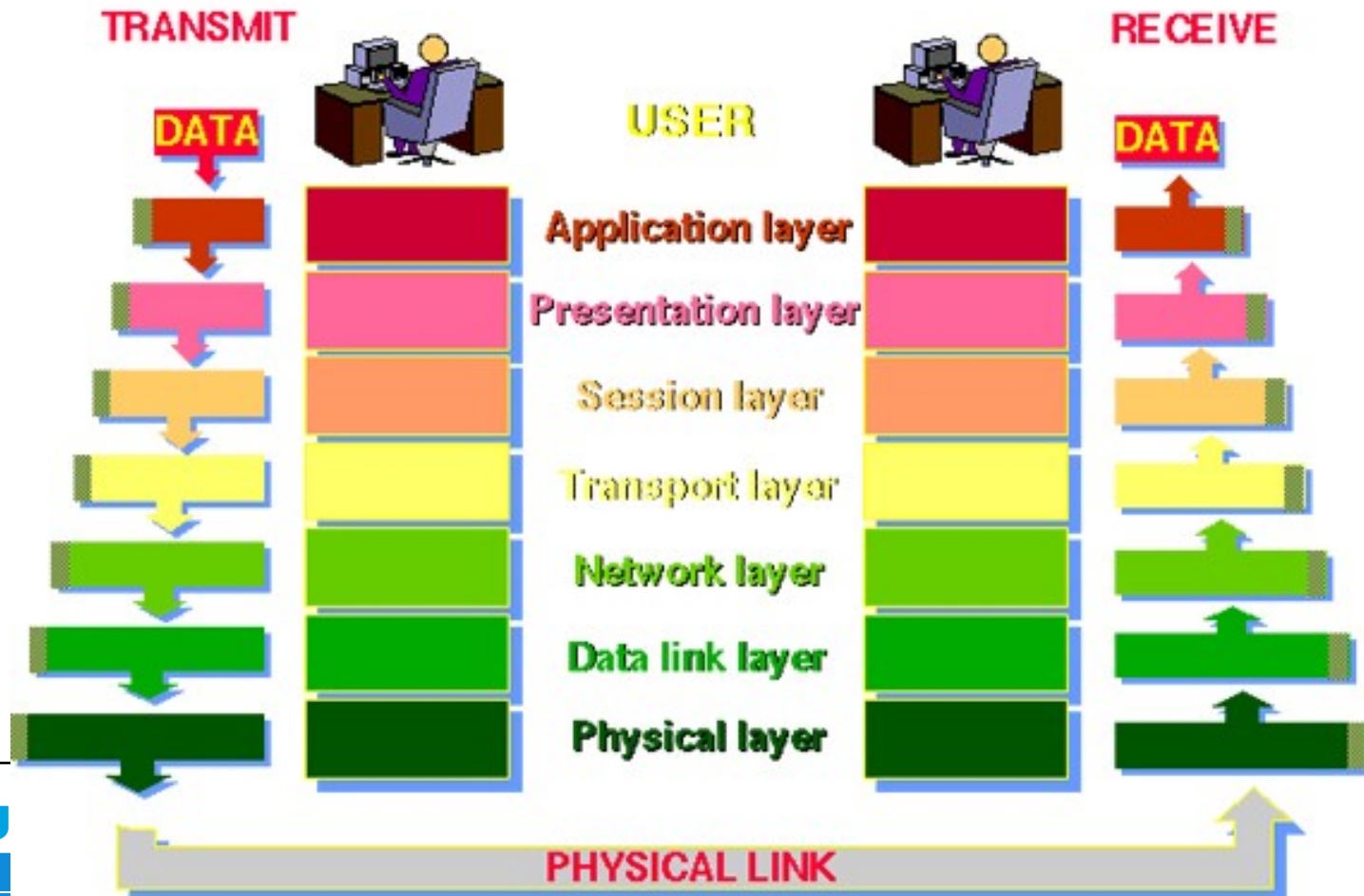


Ecological Pyramids of Biomass

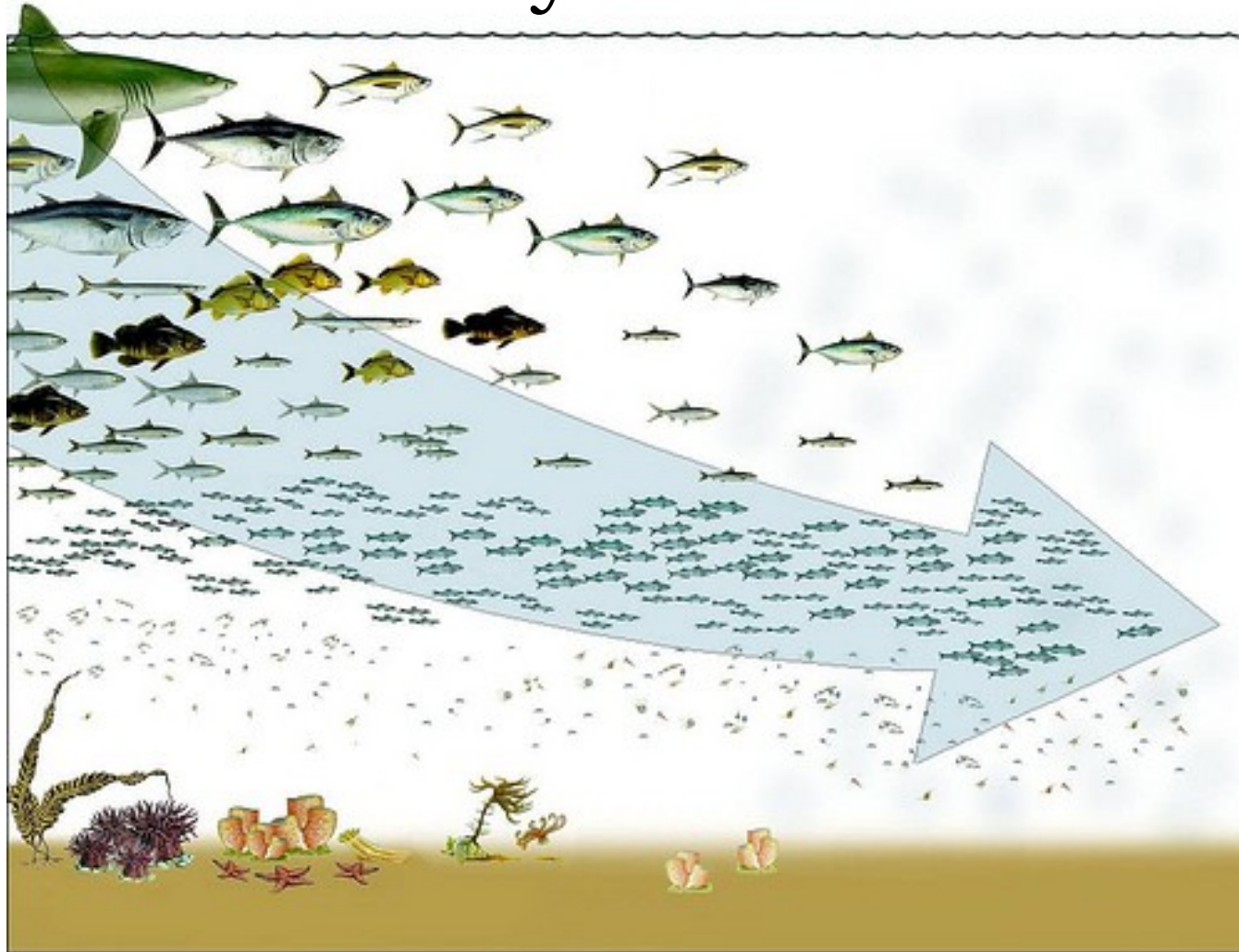


We are interacting across many, many layers of abstraction, but we are just operating a bunch of logic gates in a processor

THE 7 LAYERS OF OSI

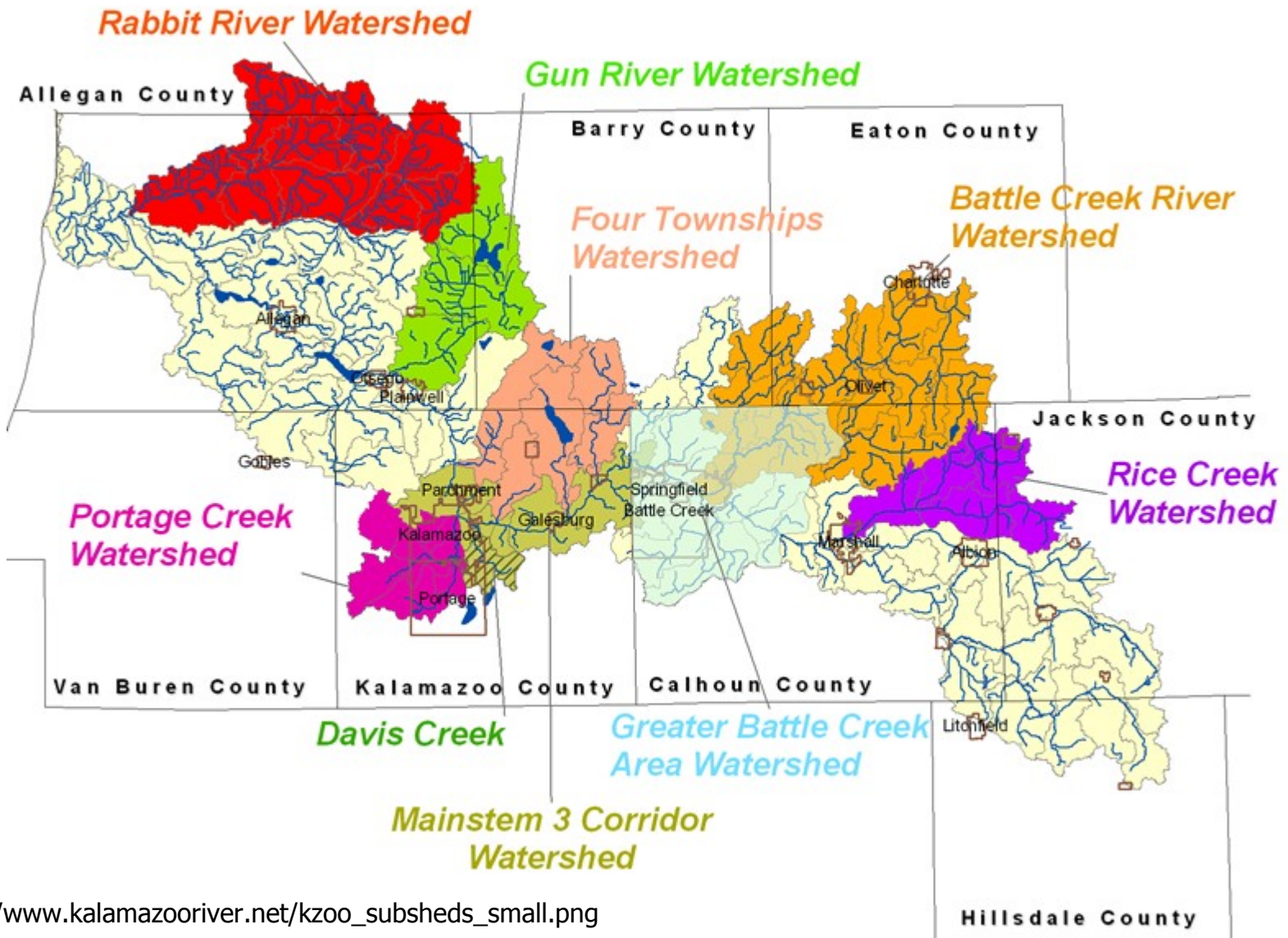


You are what you eat...



Horizontal nestedness

- Is observer dependent
 - Where does one system stop and the next one start ?
- Systems are open
 - How to determine the boundaries?



http://www.kalamazooriver.net/kzoo_subsheds_small.png

Horizontal Context Dependency



<http://wiki.tudelft.nl/pub/Education/CtIntro2009/GroepsPagina03/>

Holarchy

- Each system is a whole (holon)
 - Itself consists of other holons
 - Has an environment (the higher up holon)
- Holarchy - hierarchy of holons
 - where a holon is both a part and a whole

- Why not hierarchy ?
 - Notions of control and “better” are almost automatically associated with it

