Week 1 (Chapter 1) - Studying ecology

Definition of Ecology	the study of how organisms interact with each other and their environment
Hierarchical Nature of Ecology	individual, population, community, ecosystem, landscape, biome, biosphere
Different Approach to Studying Ecology	1. natural 2. field 3. semi-field 4. lab
Hypothesis Testing	cant be proven, prediction can be true but you can only falsify a hypothesis
2 Approaches to Hypothesis Testing	1. observational 2. experiemental

The Terrestrial Environment

Requirements to Life on Land	desiccation, gravity, temperature fluctuation
Light in Forests	sunflecks are unaltered light on forest floor, 70-80% of light reaching forest floor
Soil Properties	colour indicates soil properties, texture affects pore space, parent material, vegetation
Soil Moisture	saturated pore cant hold more water, field capacity is the amount of water the soil holds when saturated, capilary water is hte water held between soil particles by capillary force, wiliting point is when plant can no longer extract water, available water capacity is the difference between field capacity and wilting point
Soil Ion Exchange	ion exchange capacity is the total number of charged sites, clay and humus are negatively charged, cation exchange capacity is the total number of negatively charged sites in soil

The Water Cycle

Properties of Water	hydrogen atoms are asymmetrically bonded and form covalent bonds, polar, H bonds break or form to release or obtain energy, less dense as a solid, insulates, cohesion, surface tension, viscosity
The Water Cycle	water covers 75& of earth
Hydrologic Cycle	process by which water cycles from atmosphere to earths surface and back (driven by solar radiation (evaporation))
Water Vapour	precipitates and enters the cycles; interception, groundwater, infiltration, evapotranspiration
Light	only longwave can penetrate shallow depths, coral and deep water algae dont get red light
Temperature	heat from sun si distributed vertically as wind and surface waves mix
Thermocline	zone where temperature declines most rapidly, located between epilimnion and hypolimnion

Week 4-5 (Chapter 5-6)

Adaptation	is a trait with a current functional role in the life of an organism that is maintained and evolved by means of natural selection
Natural Selection	different success in survival and reproduction of individuals that reflect their interactions with the environment, evolution by natural selection requires? variation, excess offspring, death of offspring, best offspring survive, variabel trait that allows for better survival and reproduction

Week 4-5 (Chapter 5-6) (cont)

Clines	measurable, graudal chnage over a geographic region in the mean of a phenotypic trait associated with an environment gradient
Ecotype	population adapted to unique local conditions
Subspecies	a taxonomic category that ranks below species, usually a fairly permanent geographically isolated race.
Phenotypic Plasticity	the ability of a gene to express itself differently in response to the environment - s election is for plasticity not the trait
Stabilizing Selection	mean value of the trait is favoured, phenotype near the mean has the most fitness, most common type of selection
Directional Selection	extreme value of a trait is favoured
Disruptive Selection	members of a population are subjected to different selective pressures
Adaptive Radiation	one species gives rise to multiple species that exploit different features of an environment (food,habitat)
Genetic Drift	random chnages in allele frequency usually due to small population size
Founders Effect	few individuals colonize an area - their genes, good or bad are passed on
Non-Random Mating	an individual chooses it's mates based on a phenotypic character (assortive mating), mating can be with similar mates or dissimilar, or can come about due to female mate choice

Week 4-5 (Chapter 5-6) (cont)

Gene Variation is Affected By	1) mutation 2) genetic drift 3) gene flow 4) non-random mating

Plant Adaptations

C3	go through the Calvin cycle, taking in carbon dioxide through the leaves' minuscule pores, called stomata. An enzyme called RuBisCO helps the carbon dioxide combine with sugar.
Rubisco	enzyme builds sugars - costly to make
max net photosynthesis	gross photosynthesis - respiration
transpiration	driven by atmosphere evaporative demand, how water is lost
stomata	release H_2O and CO_2
water use efficiency	ratio of carbon fixed (photosynthesis) per unit of H_2O transpired - terrestrial plants balance CO_2 intake with water loss - drought tolerant plants have a higher WUE
water potential	H_2O movement is a function of differences Y atm < Y leaf< Y root < Y soil
boundry layer	layer of still air (or water) adjacent to the leaf surface
carbon allocation	stem - support and encounter sunlight root - uptake of water, nutrients and storage leaf - photosynthesis, roots =increase in H_2O and nutrients uptake but lowers carbon allocation to leaves, leaves = increase access to light and CO_2 but decrease H_2O and nutrient uptake, Low soil water plants can allocate more carbon to roots

Plant Adaptations (cont)

light compensation point (LCP)	net photosynthesis is zero (available PAR mean net net photosynthesis is zero)
light saturated point (LSP)	no furthur increase in photosynthesis (an increase in PAR will not increase the photosynthetic rate
temperature	photosynthesis and respiration respond variations in leaf temperature, both increase with temperature
water	demand for water is linked to temperature, plants balance water concentration by opening and closing stomata
C4	C4 plants are divided between mesophyll and bundle sheath cells. Two steps of C4 photosynthesis that occur in the mesophyll cells are the light-dependent reactions and a preliminary fixation of CO_2 into a molecule called malate.
CAM	photosynthesis, is a carbon fixation pathway that evolved in some plants as an adaptation to arid conditions. In a plant using full CAM, the stomata in the leaves remain shut during the day to reduce evapotranspiration, but open at night to collect carbon dioxide (CO_2).
nutrients	macro and micro nutrients, plant nutrients are related to metabolic processes, availability of nutrients influences plant survival, growth and reproduction

Week 2-3 (Chapters 3-4)

How Solar Radiation Reaches Earth	solar radiation will enter either via long or short wave radiation from the sun. It can be UV, infrared or visible light. Input of 51 shot and 96 long and then output of 30 evaporated/thermals and 117 radiated from earths surface.
Seasonal and Latitudinal Variation in Solar Radiation	the steeper angle means sunlight spreads over larger area, sunlight travels through deeper air layer. rotation causes day and light whereas inclination causes seasons and day length. seasonal variation is solar energy is greatest at high latitudes, solar radiation down with up latitude
Ocean Currents	arise from wind belts which succeed each other latitudinally, easterlies = NH-NE and SH-SE, westerlies = NH-SW and SH-NW, polar easterlies = winds move masses of H_2O which get deflected by coriolis,
El Nino	monsoons are reduced (water warmer = less pressure difference)
Ocean Gyres	wind driven ocean currents are deflected by coriolis in gyres, clockwise in NH(R), counterclockwise in RH(L)
Adiabatic Lapse Rate	rate of temperature changes with elevation (depends on humidity) dry air cools quickly

Week 2-3 (Chapters 3-4) (cont)	
Adiabatic Cooling	heat loss due to air expanding (with altitude)
As Altitude Goes Down	pressure and density decrease
Air Masses	they are not static: temperature causes air to rise and sink
Coriolis Effect	earths rotation causes water and air to deflect, law of angular motion
Intertropical Convergence	heat from sun causes air to rise (low pressure)
Air and Water in Northern Hemisphere	counterclockwise
Air and Water in Southern Hemisphere	clockwise
Atmospheric Moisture	sun warms air at equator, warm moist air rises - air fills low pressure, rising air condenses at troposphere - rain forests, air hits top of troposphere and moves north and south, cold and dry air sinks at 30º - warm as it sinks (no condensation - no rain - desserts)
Monsoons	land warms in summer , air rises and cools, relatively cols moist air from the sea rushes in rises, condense and rains, warm and wind
Vapour Pressure	as water cools it must condense to maintain vapour pressure (aka fogs/clouds)
El Nino Conditions	1. trade wins carry water and air to Australia 2. high pressure off peru, low pressure off Australia 3. upwelling off peru 4. Australia wet - peru dry

Week 6-7 (Chapter 9-11)	
Genet	individual produced by sexual reproduction
Ramet	produced by sexual reproduction
Distribution	random, clumped and uniform, abundance estimates may be skewed by spatial distribution
Geographic range	range of expansion is the result for populations introduced to a region where they did not previously exist
Density	how many per unit area
Dispersion	often tells you something about the ecology of the species
Sampling	
Age Structure	proportin of individuals in different age classes
Dispersal	movement of individuals away from place of birth (usually to vacant habitats)
Migration	two way seasonal movement usually predictable
X	age class
Nx	number of individuals in that age class
Lx	proportion of original cohort surviving to that age
Dx	number that died (sometimes a portion)
Qx	dx/nx, age specific mortality rate
Bx	mean number born in each age class
Type 1	survival high throughout life, heavy mortality at end (K)
Type 2	survival doesn't vary with age
Type 3	mortality high in early life (R)
LxBx	chance of a female of that age giving birth to female offspring

Week 6-7 (Chapter 9-11) (cont)	
Net Reproductive Rate	the sum of the average number of female offspring produced by an average female in her life (Elxbx)
Gross Reproductive Rate	sum of all offspring, the average number of offspring a female will produce in her life
Exponential Population Growth	Nt=No*e^rt
r	instantaneous per capita growth rate. how many offspring an inidividual produces per unit of time (intrinsic)
Ro	net reproduction rate - average number of females a female produces over her life time. a multiplier based on generation time.
lambda	finite multiplication rate - used for non overlapping generations - not based on generation time - you can set the intervals
K	carrying capacity, maximum # of individuals environment can sustain, population size where dN/dt = 0, n small = exponential growth, n = k = no growth, n>k = population decreases
Density Dependant Growth	