Biodiversity loss, reduces the numbers and types of species which regulates the movements of nutrients around the eco-systems. If species are lost from the system, there are less alternative pathways for the nutrients to cycle, decreasing the resilience of the ecosystem as a whole.

Cycles

processes that can be repeated continuously without degrading other processes.

Changes

life changes over time, individuals learn, species adapt and evolve.

Evolution is how life adapts to changes. Evolve or die! Loss of species, means loss of relationships, networks and complexity. It means loss of a complex environment in which species can display diverse behaviours. These opportunities to display diverse behaviours and to change resources available to other species, reduces opportunities to evolve and therefore to adapt to change and survive.

Energy Flow

Each organism needs a continual flow of energy to stay alive. The constant flow solar energy sustains life and drives ecological cycles.

Stability

Stable systems have low variability from its optimal state, they are in a state of dynamic balance where there resistance to change is maximised.

Species occupy positions in food webs, they are either species who can manufacture their energy and biomass using sunlight or species who derive their energy and biomass from others. If a particular species density falls below some threshold, the species diversity in the whole of the ecosystem may decrease, trigging ecological chain reactions, ending in a simplified or degraded ecosystem, that is less resilient.

Ecosystems have multiple feedback loops, bringing the system back into balance. The reduction in the numbers of a particular species maybe within the limits of the ecosystem for the population to recover; this is a balanced state of continual fluctuation which is adapting to changing conditions. However, lose too many of a particular species or some of a number of different species and the ecosystem loses its diversity and therefore its resilience to change.

The Earth is warmed by the Sun. This warmth is returned from Earth to the atmosphere in the form of heat radiation. Many gases in the atmosphere, including CO2, absorb the Earth's heat energy and radiate in all directions. The energy radiated downward warms the surface and lower atmosphere. Adding more CO2 to the atmosphere means more heat radiation is captured by the atmosphere and radiated back to Earth, increasing the temperature of the Earth. This is a cycle out of balance, with basic positive feedback.

Cycles

processes that can be repeated continuously without degrading other processes.

Changes

life changes over time, individuals learn, species adapt and evolve.

Weather patterns change over the seasons. Climate is the change in weather over a period of time. When we talk of climate change we can mean either a change **in** the average weather conditions or a change **of** the average weather conditions. Species respond to climate change by migration or adaption, or even death. These are changes in distribution and numbers, which will affect the relationships within the ecosystem, affecting the resilience of the ecosystem as whole.

Climate Change

Energy Flow

Each organism needs a continual flow of energy to stay alive. The constant flow solar energy sustains life and drives ecological cycles.

Stability

Stable systems have low variability from its optimal state, they are in a state of dynamic balance where there resistance to change is maximised.

Over a long evolutionary time period a dynamic balance has developed in a synchronicity between the bud burst of trees, the hatching of caterpillars and the timing of egg laying in birds. If warmer temperatures encourages an early bud burst, many caterpillars may not have hatched, so some young chicks may starve. This changes the optimal state of the system, throwing out the dynamic balance, and changing the trophic structures of the ecosystem.

As the Earths temperature warms, the system resilience to absorb this disturbance and still retain its basic life supporting temperatures may be compromised. Feedback systems such as the albedo effect, or the melting of the permafrost, decrease the diversity in the Earths ecosystem meaning there may be less ways for Earths systems to balance the effects of global warming within the current system state. This may lead to rapid climate change between stable states; with Earth moving into a dynamic balance with permanently warmer climate.

The hydrological cycle, is a closed system, consisting of transfers, stores and inputs of water. Processes such as interception, evapotranspiration, infiltration and precipitation drive the main cycle. Within this cycle, another nested cycle of the Nitrate cycle can be affected. Increased runoff, from intense precipitation events, can carry nitrates from agricultural fields through the river systems, which collect as the sediment settles, as the water speed drops, creating dead zones within the river systems, usually near the mouths.

Cycles

processes that can be repeated continuously without degrading other processes.

Changes

life changes over time, individuals learn, species adapt and evolve.

Human population growth, urbanization and rising incomes are meaning the demands for water usage are changing. Climate models, together with these demands, suggest that the resilience of our ecosystems and social systems maybe compromised and require innovated adaptions and ideas. For example relationship building between countries to provide distribution networks and to ensure the global water distribution address this scarcity.

Global Freshwater Use

The hydrological cycle is driven primarily from the energy of the sun. The evaporation of liquid water from the surface of Earth, into water vapour is caused by the process of latent heating. Latent heat is the energy required to evaporate surface water and which is then released to the atmosphere when cloud formation occurs. When this energy is released it warms the air surrounding the newly formed water droplet, causing the water droplet to want to rise and condense. This increases the cloud height and with the increased humidity due to warmer global atmospheric temperature, can cause increasing intense thunderstorms and hurricanes.

Energy Flow

Each organism needs a continual flow of energy to stay alive. The constant flow solar energy sustains life and drives ecological cycles.

Stability

Stable systems have low variability from its optimal state, they are in a state of dynamic balance where there resistance to change is maximised.

A local dynamic balance in the hydrological cycle could be displaced as the global temperatures increase, the atmosphere can hold more water. Increased evaporation in some areas could dry them out, causing more precipitation in others. Those areas which experience a decrease in the precipitation, will then experience an accelerated rate of surface drying, reducing soil moisture. This both reduces the downward percolation of water, which means less replenishment of groundwater supplies, causing less groundwater supplies in areas with less precipitation. This is an example of positive feedback.