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9/15/14

Geology

**Week 3 Homework**

All soils above the water table have three phases; solid, liquid, and water that then help determine some other really important properties. The first of these is plasticity. This is the ratio of the water limit in the soil that determines if it is in a liquid stage, a plastic stage, or a solid stage. Waters with a low plasticity index are dangerous because with a very small amount of water they can quickly turn from a solid to a liquid.

The next property is soil strength which is the ability the soil has to resist deformation. What helps determine this is the cohesion and frictional force of the soil. The cohesion of the soil is what helps it stick together. The example in the book is building a sandcastle. The frictional force is dependent on a lot of things. This is the reason why we don't sink very deep while walking on dry sand.

The book now talks about soil mechanics which is the study of prediction what soil will do under certain conditions. The way that this is all calculated uses the volume and the weight of different properties in the soil such as mass, gas, and water. It takes into account a lot of complex variables such as the porosity, void ratio, moisture content, degree of saturation, and specific gravity. An example the book gives working out how these things can be used shows that the equation can be manipulated allowing for someone to calculate the water content, degree of saturation, porosity, and other properties.

The next thing talked about is sensitivity. This is how soil can handle types of disturbance such as vibrations. Sand and gravel are the least sensitive because of how small they are. Things like clay however can lose over half of their strength when something shakes them. Wet sand however is very sensitive due to liquefaction. This can be tested by standing in wet sand and shaking your feet.

Compressibility is the measurement of how well a soil can decrease its volume or compress. This happens because of the plasticity trait of soil. If something doesn't have this plasticity it will have the potential to crack after it settles.

Erodibility on the other hand is the measure of how easy wind and water can transform soil. Typically sand and silts are the ones that have a high erodibility while things composed of clay are more resistant. Permeability on the other hand doesn't measure how water can transform something, but how well something can absorb water. Again sand is very good at this while clay isn’t.

Corrosion is a chemical reaction that leads to the decomposition of certain materials. This is measured by not only the soil, but the object buried underneath (pipe, cable, anchor, etc.) Then the amount of water will affect how well an electrical charge can move through furthering the corrosion.

Ease of excavation is pretty self explanatory. It refers to how easy it is to dig soil. If you don't have to scrape it first its called a common excavation. If it requires scraping its a rippable excavation. Extreme measures may end up requiring blasting or rock cutting.

The shrink-swell potential is the last thing talked about in this section. It talks about the damage that can be done due to expansive soils. Houses and foundations can experience severe damage due to this. To avoid this happening while building, contractors can perform laboratory testing to identify the shrink-swell potential of a certain soil.

1. Define Biodiversity: Biodiversity is the number of species in a certain area that live and interact with each other.
2. Biodiversity is important because it allows for an ecosystem to flourish. Every part in it down to the bacteria under the rock play a very important role in allowing it to function and grow.
3. Elk and the Wolves: Biodiversity is such a complex thing that something seemingly harmless such as a lack of wolves in Yellowstone can play a very important role in showing why biodiversity is so important. When the wolves were taken away from yellowstone it caused a chain reaction in Yellowstone. Once the wolves were gone this allowed for the Elk to roam wherever they wanted. This in turn allowed for the Elk to consume the trees that provided shade for the river. Once this happened an even bigger chain of events happened leading to the loss of beavers, loss of riparian functions, and loss of the food web for plants and other animals. Ultimitaley this ended up morphing the river and causing it to widen and erode. Once wolves were introduced back in 1995, things began to fix themselves. Elk began to stay away from the river which allowed for the trees to grow back which allowed for the rest of the chain to fix itself. This just shows how big of a role something small and little can play in a larger sense.
4. Another example of biodiversity that is given in the book is about kelp, sea otters, and sea urchins. Again, when someone would look at these 3 things, they wouldn't think that they are related when infact they are heavily dependant on each other. When otters are present in an area, they eat the urchins. When the urchins are all gone this allows for the kelp to grow because there is nothing eating them. When there is a healthy kelp area this allows for many other things to benefit. However when the otters aren’t present in an area, the urchins flourish and eat the ends of the kelp that keep them under water. This then causes for the kelp not to grow well. Again this is just another example of how things work in chains and affect each other.
5. The last example shows how human interaction can destroy certain ecosystems. Back in the 1940’s a pesticide called DDT was being dumped into the ocean. This made its way out to what are called the Catalina islands. Since this was in the water it was being consumed by the organisms that bald eagles eat to survive. Over time the DDT began to harm the bald eagles when they would lay their eggs because the shell would be too thin. Eventually, because of human interaction, all of the bald eagles on the island were exterminated. Starting in 1990, the people that were responsible for dumping this chemical were held responsible for this and had to pay a large sum of money that went towards fixing the islands. Through lots of hard work and careful human intervention, eagles now live on the catalina islands again and can successfully mate and lay their eggs.