Bavarian Forest, 20.09.2012

In the course of our Intensive Program „Soil and Water“ we went on a 2 Day excursion to Sumava Mountains (Czech side) and to the Bavarian Forest (German side). In the following the excursion through the national park “Bavarian Forest” is represented. It is divided into several parts which refer to the different sites we stopped. There our guide explained several things about the plant community, the ecosystem itself and the management measures.

The first stop was at the border of the forest entrance, where our guide told us a few general facts about the NP. He went on to a rather young piece of the forest where no dense canopy is found. There has been a clear cut in the 80’s. Even if the silver fur and the beech trees are prone to frost in the cold periods of the year, there are still a lot of beech trees growing. This plot shows a typical acid beech forest, where not many other plants are able to deal with the acid conditions.

Picture 1 (left) shows young areas of the forest
Picture 2 (right) shows the affects of clear cutting in the 80's

The second stop was after a short walk where we recognized some tractor traces, which show us, that the forest has always been used even if the last 20 years were without any intervention. There the guide drew a comparison between the natural management during the past years of Sumava Mountains and the Bavarian Forest. Whereas the Sumava Mountain NP has been under constant use by Prince Schwarzenberg (forest industry concerning Norway spruce) the Bavarian forest was controlled and owned by government (less use). As a result we have different starting situations that show diverse ecosystems and require specific managements.

The third stop was in an old part of the forest, where Mr. Muhle explained several facts about lichens and showed examples. As a prove that the part of the forest has to be old, he showed us lichens, which need over 100 years to establish on the thick moss layer. Yellowish lichens with white spots and close contact to the bark are band lichens. Lichens that are green when wet are Pham lichens, which are gathered as an ingredient for perfumes to make it last longer on the skin. An acidophilic species is the *Folliculitis barbae* (beard lichen). The *Hypnum fertili* grows cocoon logs and has been gathered in ancient times to sleep on, since it prevents flies from coming near.

Pictures 3 and 4 show the explanation of lichens by Mr. Muhle

Fourth stop was a very short break to consider some rare fungi species on the dead wood of the silver fir. It needs around three years and wet conditions to grow and begins to spread via spores along with the increasing of deadwood in the forest.

Picture 5 shows a rare fungi species, the *Hericium sp.*

On the fifth stop we were located about 5 km away from the starting point. Close to the spring of the river Moldow there are different weather conditions and micro-/mesoclimate (average temperature: 4°C; average precipitation: 1200-1800 mm/year). On this stops position there were lightly different values (average temperature: 6°C; average precipitation: 800-1000 mm/year). Between 2000 and 2008 bark beetle affected this (mixed) forest. It created a lot of dead wood within a short time and caused a homogenous plant community, whereas in a virgin forest it is heterogeneous. There are no crowns for protection and plants that are prone to frost cannot compete with frost resistant plants. Furthermore we differentiated *Abies alba* and *Picea abies* (fir and spruce). *Abies alba* has upward branches, light reflecting needles and snowflakes under the tree. *Picea abies* has downward brunches, darker reflecting needles and its crown gets bigger in the upper part.

Picture 6 shows a mixed forest, which was affected by heavy bark beetle afflictions

On the sixth stop roots and damages of trees were the main topic. Most of the root systems have different parts. The lateral parts are for supply of water and nutrients in upper horizons. The deeper parts (sinkers) supply water from deeper layers in case of drought and stabilization. Roots of deeper layers die in case of heavy rain due to water logging (not enough oxygen for root respiration), according to this, trees are easy to uproot (typical problem of spruce whereas silver fir is not affected by this kind of problem). Another point is windstorms. They either break down the trees or they uproot them. Some further problems and dangerous situations are damage or cut off of the small (most important) roots, less water supply and in case of hot weather the water supply breaks down and the tree is damaged but still standing.

Picture 7 shows the root system of a partly uprooted tree

The seventh stop was next to a small, brownish colored stream with foam on its surface. Foam is not always an indicator for bad water quality. In this case it came from decomposition of acid organic material by (phototrophic) microorganisms. The brownish color came from humic acids. Nitrate is also movable in water (eutrophication) and may become toxic for some invertebrates. Scientists found out, that drought became more common after bark beetle infection. Warming rose because more sunlight was able to reach the ground and dead wood became water storage. After the forest died back, nutrients are leached because no plants used/took them. There was high decomposition of soil organic matter and the nutrients were washed in the groundwater. Even small layers of grass are capable of stopping this process. There has to be an organism no matter which size, to consume the nutrients to keep them in the circle and the system. Another point is the decomposition of wood. The half time of decomposition of a spruce tree is about 25 years. Contact of dead wood with soil and moisture influences and increases decomposition highly. Fungi also influence the speed of decomposition. In three weeks fungi can consume an entire leaf. It can detoxify the litter and wood and the decomposition of complex compounds is more efficient compared to bacteria. Acidification affects the decomposition ratio of bacteria and fungi.

Picture 8 shows a small brownish stream with foam caused by decomposition on its surface

On the eighth stop we talked about interventions in natural systems such as these national parks, especially about road infrastructures in forests. Workers of the park need to enter the forest and they have to use heavy machinery to manage the forest. On the other hand for example stream flows are changed by roads, which leads to a change of environment and the ecosystem. Roads with stoned bodies are a insuperable border for soil organisms and there is no spreading through the landscape.

The ninth and last stop refers to wet soil and peat bogs. Peat bogs are on places with small watershed and the ground is poor of peaks. The trees do not have such a good quality. Drainages have been installed in a depth about five meters in former times to dry places out and to push tree growth. The phenotype is bonsai-like in real peat bog conditions. To restore the bog ecosystem dams are necessary to stop the water channels. Water Level in peat bogs normally is about 20-25 cm under surface. The channels reach through the ground and a problem at the visited point was that the channels continuously flew around the dams. Therefore there are sometimes soil pipes even in naturally peat bogs. If they are drained, the water escapes through these pipes.

Pictures 9 and 10 show a peat bog once drained by humans in order to make the wet area available for forestry. The dams are a try to re-damp the area.