Tuesday, September 18, 2012

Most of the students gathered in B3 at 8:40. The introductory word was provided by Marian Kazda.

At 8:45 Tomáš Picek: Soils and ecosystem dynamics in South Bohemia

His presentation was about the South Bohemia region. Students got basic information about geology, climate and soil types which in South Bohemia are mainly cambisol, gleysol and podzol. He mentioned the local problem of illegal extraction of Moldavites. Moldavites are olive-green or dull greenish vitreous substance possibly formed by a meteorite impact. They are unique, because they can be found only on few places in South Bohemia and Moravia. Thus they are quite valuable in jewelry. Non-legal extraction is very devastating, because tonnes of soil are digged out and so large areas of forests and fields are damaged. Next slides showed the land use changes during the last two centuries. While in 1840 50% of the land was used as arable land, in 2000 it was only 36,8%. Large percentage of land is used for other purposes than agriculture or forestry, like building of supermarkets, industrial zones, parking places etc. Still in 1949 most farms were small (small fields, varied mosaic of different crops), in 1978 intensification of agriculture led to huge fields, that lowered the biodiversity due to the end of traditional management. Next part of the presentation informed about the threads to the soil in Czech Republic. It showed that the biggest thread here is soil erosion. Picek informed about the drainage in the past and its consequences and he mentioned the problem of the forestry as well. Natural composition of forests in the Czech Republic would be 40% beech, 20% fir and only 11 % spruce. Current composition is more or less a plantation of spruce, because it is 56% abundant. There are only remains of natural forests in Boubín and Žofín reserves and in the upper parts of Šumava Mts. He spoke about the acidification of the soil and water in the past and about the importance of the wetlands. There are three important wetland areas (Ramsar sites) in South Bohemia region: Sumava peatlands, Trebon peatlands and Trebon fishponds. The biggest threads for wetlands are drainage and eutrophication. In conclusion, the main anthropogenic factors affecting ecosystem dynamics in South Bohemia region are: land use, eutrophication, drainage of soils, soil erosion and compaction, acidification (N and S deposition) and use of pesticides. There are also positive changes: restoration of peatlands (previously drained) and river meanders, management of meadows, change of land use – e.g. arable soil to permanent grasslands or forests. The discussion was about other types of soil erosion (wind) after the discussion there was a coffee break.

At 10:35 Alar Astover: Protection and sustainable use of soils.

It was mainly a theoretical presentation with many definitions. He mentioned the term “sustainable development”. One of the definitions is that it is a mix of social acceptance, ecology and economy. He divided decisions on long term and short term. On some cases he showed that arable land per capita is continuously decreasing – 0 4 ha in 1960 -> 0,2 ha in 2000. Production in Western Europe countries is now even lower than in 1920. This shows the very low efficiency of soil use. Next part of his presentation was about soil quality. There are so many indicators and no universal quality rating system which means problems when comparing different parts of the world. Some properties of soil are static and some dynamic but it always depends on the time scale. No less important is the spatial scale (global, continental,…regional). For some countries (Czech Republic) there are very detailed soil maps (scale 1:5000). Astover spoke about new ways of getting soil data as well.

At 12:10 - lunch

At 13:30 Marian Kazda: Roots and the use of soil water

- Roots functions
  - Water uptake
  - Nutrient uptake
  - Plant anchoring in the soil
  - Interaction with biotic and abiotic soil environment
- Rhizosphere

  Definition: The rhizosphere is a close vicinity of roots with various biotic and abiotic interactions.
- Root distribution soil
  - Vertical distribution:

    In the top soil is the highest root density the deeper the less roots.

    The distribution is different between Hydric, Mesic and Xeric plants.

    ? Why are most of the roots in the upper soil?

    - Because when it rains the plant need the roots of the upper soil to use the rain water efficiently.

    In dry environments are more roots located in the lower soil horizon. The plant redistributes the water with the hydraulic lift to the environment and the soil surrounding. -> ?Why?

    - The water is for the microorganisms. When the plant provides the water for the microorganisms it gets the nutrients. Also keeps the plant her upper roots alive to be prepared when it is raining to compete successful against the other plants.
- Root architecture

  Roots respond to the supply of nutrients.
- Root architecture and soil exploitation

  You can distinguish between herringbone and dichotomous root architecture.

  Herringbone has one main axis and dichotomous is consecutively divided into two different axes.

  The Herringbone root is better for the static supply as for the dynamic nutrient supply where the dichotomous root system is better.

The dichotomous system is preferential for exploitation of resources located in specific soil areas (patches). Therefore roots are clustering in the natural soils, as observed in single-species stands.

- Root distribution in mixed stands

? When growing together, do both species from common clusters or are their clusters separated?

- They build common clusters because both compete on nutrients -> The roots of both species are mixed.

- Changes in soil moisture content during and after the irrigation

As roots are clustered, they utilise water as resource unevenly.

When irrigated, in root free zones an increase of water is recorded earlier than in root clusters. Because the roots sucks the water up needs the water more time to rinse down to the sensor.

The soil moisture content changes over a time span of 24 days. The soil moisture declines faster in soil patches with root cluster. The highest soil water extraction occurs during afternoon because the water potential decreases especially in the roots.

Soil moisture decline is delayed in areas of low rooting intensity. General view on natural distribution of resources. The Distribution of light and CO_2 concentration in the above ground growing space is according to the predictable gradients.

Below ground: Heterogeneously distributed multiple resources water, nutrients, biology associations are of low predictability. The root distribution follows the gradient of the soil properties and resource distribution in patches.

- Root architecture

  - Clusters of available nutrients accompanied by preferential uptake of the seepage water.
  - Root clustering is a rule in natural soils for optimized exploitation of aggregated resources.

At 15:00 Santruckova and Urbanova: Introduction to excursion topics " Sumava mountains"

Dynamic of mountain Norway spruce forests in the Sumava Mountains

- Climate: the mean temperature increase and a shift in rainfall distribution over the years brings drought in the spring. The precipitation changed especially in the spring -> lower precipitation.

- Atmospheric pollution: In the last century the S. M. were exposed to heavy atmospheric pollution. Between 1950 and 2000 was a change from very high pollution to very low pollution.

  The changes in acid deposition caused significant changes in the soil chemistry. -> rapid decline in pH, nutrient availability and an increase of Al in the soil.

- ? Did spruce trees reply to the changes in environmental conditions?

  Isotopic and chemical analysis have shown that the spruce trees in the S. M. are negatively affected by the change in environmental conditions. (The increase of the climate temperature is stressful for the spruce.)

- Questions to think about during our trip to S.M.

  - Which consequences of Kyrill Windstorm in 2007 can you see in the S. M.
  - Did the storm support the bark beetle attack
  - What management should be used in the bark beetle affected area.

  At 15:45 Seminars

- Burkhardt and Luderer: Progress of forest regeneration after a large-scale die off in the Bavarian Forest National Park

  Problem: 1993: spread of the Norway spruce bark beetle in small areas

  1995/96: climax --> 583 ha died off

  Meanwhile 2031 ha are affected by the spruce bark beetle

  1997 Epidemy fades away

  Goal: To monitor the progress of changes in:

  - The density of regeneration
  - The tree species composition
  - The relative heights
  - The damages to individual plants

  Some other significant disturbances for the development of forest:

  Results showed that the Norway spruce is well adapted

Can re-colonise large disturbed areas (airborne seeds)

Is frost resistant, can cope with the climate of open areas, adapted to the soil conditions

the blossom frequency plays a role

Mast-years can occur rarely

good, that the trees blossomed 1995found out: there‘s a correlation between the Norway spruce cone production and the explosive reproduction of the Norway spruce bark beetle appearance

Blossoming is stimulated by high temperatures and sunlight

beetle population also needs dry and warm years

beetles infest only old trees (50-70 years and older)

Trees can produce seeds before the beetles can kill them interaction

- Strittmatter and Ternus: Proper zonation – an essential tool for the future conservation of the Šumava National Park

Since its establishment the zonation of the Šumava NP

has undergone significant changes and currently and for

many years has been evaluated as unsatisfactory. Several

new zoning arrangements have been proposed over the

last couple years, all of which indicate that the most valuable

parts of the area (i.e. the core zone or Zone I of the

Šumava NP) are still in the same locations. Natural conditions, habitat qualities and occurrence of rare species are stable or only changing slightly in time. But the key question is how a new zonation proposal will respect the

need to have zones of sufficient size. Whether or not only

the sites of great conservation interest are protected (e.g.

only the moors without the surrounding waterlogged forests

or only fragments of old growth forests without the

surrounding close to nature forests) or also the area immediately

surrounding and adjoining these sites is important.

If not, we are left with a very fragmented zonation, which could be called “pearls archipelago”. The most valuable parts of the area, the so-called pearls, are strongly threatened, especially if intensive or inappropriate management practices are applied in their surroundings (e.g. clear-cutting of spruce stands affected by bark beetle or changes in water regime due to construction of new roads or extensive maintenance of old ones). But there is also another possibility. The natural islands of highest value can be connected to bigger units by bio-corridors or transition zones with natural or close to natural habitats large enough to be effective. The careful evaluation of the quality and overall potential of the area (zone) is essential.

If the species compositions of these areas, status of key components of the ecosystem and the protected phenomena occurrence are in natural or a close to natural state, it is desirable to allow spontaneous development and avoid human intervention.

We can assume that the quality of the natural conditions and potential for natural development in the Šumava NP are high. There is a unique opportunity to change a currently unsatisfactory zoning and use it as an effective tool for protecting the Šumava NP.

This paper presents mainly biological arguments, but social and political aspects are also very important and need to be addressed during the negotiation process. A consensus of the opinions of the public, politicians, local representatives, protected area managers, biologists and NGO s is necessary for safe guarding the future of the Šumava NP