Masteroppgaveforslag – EcoForest – NMBU

In the Ecoforest project we study the long-time effects of forestry on biodiversity (insects, fungi, bacteria) in soil and dead wood, as well as carbon storage and differences in ecosystem functions. The project compares near natural forests that have never been clear-cut with previous clear-cut forests that are now grown to a mature state. Check out our webpage for more info: Ecoforest.no (in Norwegian – but also some nice photos of our work)

I EcoForest skal vi undersøke de langsiktige effektene av det moderne skogbruket på det biologiske mangfoldet i jord og død ved, og hvordan dette mangfoldet igjen påvirker karbonlagringsprosessene. Studiene skal utføres ved å sammenligne eldre skoger hvor det tidligere har vært flatehogst, med skoger som aldri har vært flatehogd. Sjekk ut våre nettside for mer info: Ecoforest.no

The Ecoforest group at MINA is Johan Asplund, Anne Sverdrup-Thygeson, Tone Birkemoe and Line Nybakken as well as the two PhD-students Rieke Madsen and Milda Norkute. And a post doc will join us within 2022. There are also 3 master students already working on the project. In addition, we have collaborators at the University of Oslo, NIBIO and NINA.

Master projects in 2023

Effect of forest management history on insect diversity and biomass

In this master thesis we will use standard insect traps (window and malaise traps) in the 10 site-pairs and measure total insect biomass as well as beetle diversity by morphological identification. Our main hypothesis is that both biomass and diversity are lowest in the forest that have never been clear-cut. Suitable for 1-2 master students.

Contact persons: Anne Sverdrup-Thygeson, Tone Birkemoe, Milda Norkute,

Effect of forest management history on ecosystem functions as determined by insects

In this master thesis, there are several functions that can be identified (1 master project will fit well with each function studied)

1. Difference in predation on invertebrates. Here we will use standardized plasteline butterfly-larva placed out in the forests and count the number of attacks as well as types of attacks (birds, mice, other insects, slugs) by the marks left on the caterpillar . The overall hypothesis is that there will be a richer diversity of predators in the near-natural forest and the caterpillar will be more attacked at these sites
2. Difference in carcass decomposition. Insects are important decomposers of carcass, with blowflies attacking the species at a very early stage followed by a large number of beetles and more flies and other diptera. In this study we will add carcasses (mice, other?) to the two forest types and measure weight loss and stages of decomposition through time. We will use manual observation as well as time-laps cameras. An additional twist might be to add netting (looking at decomposition with and without insects) and digging into the soil (where the insect migrate after having fed on the carcasses) for species identification.
3. Difference in dung decomposition (cow, sheep, horse, other?) will be installed in 3 or more dung piles and left for 3 days in the forest. We will then calculate average % dung dry mass removed and compare between the two forest types. An additional twist might be to add netting (looking at decomposition with and without insects) and digging into the soil (where some insect migrates after having fed on the dung) for species identification.
4. Difference in bark beetle enemies as estimated by beetles being attracted to bark beetle pheromone applied to traps in the two forest types.

Contact persons: Tone Birkemoe Anne Sverdrup-Thygeson and Milda Norkute

Importance of secondary metabolites for CO_2-fluxes from fresh spruce logs

In this thesis you will measure secondary metabolites in bark and wood of freshly cut spruce trees and correlate this with difference in respiration form the logs after being transferred to the two forest types (4 logs per site). Hypothesis: that secondary metabolite concentrations modify the decomposition activity, or CO_2-flux, from logs after cutting.

Contact persons: Tone Birkemoe, Line Nybakken and Milda Norkute

To what extent does dead wood fertilize forest soils?

In this master project we will look at nutrient contents in dead wood and the nearby soil and compare with similar soil not connected to dead wood. The comparison will include a wide range of wood decay stages and adjacent soils as well as the experimental dead wood.

Contact persons: Tone Birkemoe, Anne Sverdrup-Thygeson and Milda Norkute

Effects of forest history on litter decomposition

In this thesis you will study decomposition of forest litter (spruce needles, bilberry leaves) which is already deployed in so-called litter bags in the forests. They will be sampled from the field after one and two years, and you can measure mass loss, loss of carbon, nitrogen as well as certain carbon-containing compounds. The thesis will involve some field work but most lab work.

Contact persons: Johan Asplund, Line Nybakken, Rieke Lo Madsen

Effects of forest history on forest floor CO_2-output (respiration)

CO_2 is released from the forest floor when organic material decomposes and by the organisms living in soil. Is the respiration different in old near-natural forest than in mature forests that was clear-cut 60-70 years ago? In this thesis you will do field work during the growing season 2023, measuring CO_2-output in the forest.

Contact persons: Johan Asplund, Line Nybakken, Rieke Lo Madsen, Janne Kjønaas

Effects of forest management history on fine root biomass, fine root litter input and mycorrhizal colonization

Roots are a major part of belowground carbon in boreal forests, and in this thesis, you will estimate how much root contribution to soil C and the yearly input differ between mature forests that have once been clear-cut and forests that never have been clear-cut. The thesis will involve both field and lab work.

Contact persons: Line Nybakken, Johan Asplund, Rieke Lo Madsen, Janne Kjønaas

Condensed tannins in relation to soil processes

Spruce trees and dwarf shrubs produce large quantities of condensed tannins, which are complex phenolic defence compounds. These compounds have «after life» effects in the soil where they inhibit microbial activity and immobilize nutrients through complexation. In this thesis, you will quantify condensed tannins in soil samples and (1) compare this between the two forest types, and (2) relate condensed tannins to soil respiration (a measure of metabolic activity) and vascular plant species composition. Soil respiration measurements and vegetation analyses are performed by others in the project.

Contact persons: Johan Asplund and Line Nybakken

Forestry history in boreal production and set-aside forest – impacts on ecosystem carbon stocks

Humans have through centuries extracted wood from the Norwegian boreal forest. Nearly all forests have experienced cutting operations at some point in their history. The historical cutting intensity ranges from removal of individual trees for firewood or in diameter-based selective cuttings, to thinnings of middle-aged stands, and final felling of the majority of the mature stand. The type of cutting and its intensity can be determined by a systematic survey of cut stumps. In addition to removal of trees by humans, trees are killed by natural disturbances that may take down individual trees or many trees, depending on disturbance agent (e.g. pathogens, pests, storm, fire) and disturbance intensity. Events that increase light availability in the forest are possible to date by assessing growth release events in living trees, based on increment core samples. The cut stump survey, archive data and local knowledge helps in interpreting the growth release events as natural or human-caused. The impact of the intensity, timing and frequency of cutting activities – management history – on the above- and belowground carbon stocks of today (available through project EcoForest) will be assessed. This will bring valuable new knowledge about the direction, size and duration of the impacts of management on ecosystem carbon stocks.

Contact persons: Johan Asplund and Line Nybakken.
This thesis will be co-supervised by Jenni Nordén at NINA