

Assignment No. 4

Topic 4: Biodiversity and Its Conservation

Retention approaches in forestry -

The research on tree retention is mainly conducted within the large multidisciplinary research program [Smart Tree Retention](#) with researchers on ecology, political science, forest planning, conservation planning, and landscape architecture, and with participants from SLU, IIT and Indian universities. The research at our unit here at SLU Uppsala includes [a global overview](#) on practice and research on retention forestry, and [structural changes in young forests](#) (National Forest Inventory data). Ecological studies embrace [saproxylic beetles](#) on clearcuts as well as [lichen epiphytes on retention trees](#). We are also conducting a study on the [survival of red-listed species on clearcuts](#), based on observations before and after logging, and with a special focus on the role of retained structures. Further, we are working with a [systematic review](#) embracing the large number of studies on the retention approach conducted during the last two decades, on the relation between retention amounts and biodiversity response. Apprehensions have been raised that biofuel harvest (slash and stumps) may damage and reduce living as well as dead retained trees. We are studying this in a nation-wide field study by comparing types and amount of retention in a number of stands with and without [biofuel extraction](#).

Conservation Planning

The research on conservation planning at the unit is mainly focused on forests and woodlands and includes studies on the [optimal age distribution of forest reserves](#) and [how to select retention trees in a cost-effective way](#). We also work with more specific methodological aspects of spatial planning such as [how to combine multiple biodiversity criteria when designing forest reserve networks](#).

Biodiversity

Biodiversity is the degree of variation of [life](#).^[1] It is a measure of the variety of organisms present in different ecosystems. This can refer to [genetic variation](#), [ecosystem](#) variation, or [species](#) variation (number of species)^[1] within an area, [biome](#), or [planet](#). Terrestrial biodiversity tends to be highest near the [equator](#),^[2] which seems to be the result of the warm [climate](#) and high [primary productivity](#).^[3] Biodiversity is not distributed evenly on Earth. It is the richest in the tropics. Marine biodiversity tends to be highest along coasts in the Western [Pacific](#), where [sea surface temperature](#) is highest and in the mid-latitude band in all oceans. There are [latitudinal gradients in species diversity](#).^[4] Biodiversity generally tends to cluster in hotspots,^[5] and has been increasing through time^{[6][7]} but will be likely to slow in the future.

1. Habitat destruction

[Habitat](#) destruction has played a key role in extinctions, especially related to [tropical forest](#) destruction.^[131] Factors contributing to habitat loss are: [overconsumption](#), [overpopulation](#), [land use change](#), [deforestation](#),^[132] [pollution](#) ([air pollution](#), [water pollution](#), [soil contamination](#)) and [global warming](#) or climate change

2. Introduced and invasive species

Barriers such as large [rivers](#), [seas](#), [oceans](#), [mountains](#) and [deserts](#) encourage diversity by enabling independent evolution on either side of the barrier, via the process of [allopatric speciation](#). The term [invasive species](#) is applied to species that breach the natural barriers that would normally keep them constrained. Without barriers, such species occupy new territory, often supplanting native species by occupying their niches, or by using resources that would normally sustain native species.

3. Genetic pollution

Endemic species can be threatened with [extinction](#)^[143] through the process of [genetic pollution](#), i.e. uncontrolled [hybridization](#), [introgression](#) and genetic swamping. Genetic pollution leads to homogenization or replacement of local [genomes](#) as a result of either a numerical and/or [fitness](#) advantage of an introduced species.^[144] Hybridization and introgression are side-effects of introduction and invasion.

4. Climate change

Climate change has seen many claims about potential to affect biodiversity but evidence supporting the statement is tenuous. Increasing atmospheric carbon dioxide certainly affects plant morphology^[157] and is acidifying oceans,^[158] and temperature affects species ranges,^{[159][160][161]} phenology,^[162] and weather,^[163] but the major impacts that have been predicted are still just *potential* impacts. We have not documented major extinctions yet, even as climate change drastically alters the biology of many species.