Methods of field surveys of vegetation structure, biomass analysis and floristic composition

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Plant community is a key problem of vegetation science!

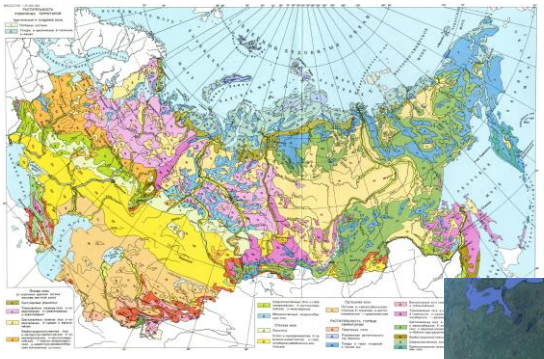
Classical definition

Plant community (sometimes "phytocoenosis" or "phytocenosis") is a collection or association of plant species within a designated geographical unit, which forms a relatively uniform patch, distinguishable from neighboring patches of different vegetation types. The components of each plant community are influenced by soil type, topography, climate and human disturbance.

Modern opinion

Plant community as aggregate of plant populations within homogeneous area is an abstraction and result of pragmatic reduction of multidimensional continuum

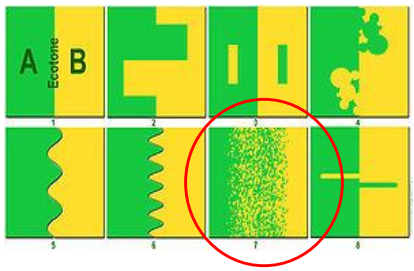
Discrecity (discontinuity) and continuality of plant cover



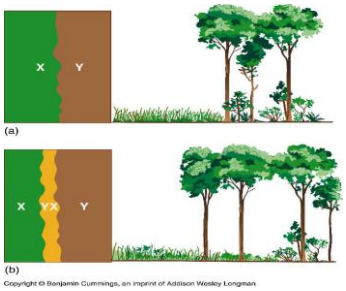
Plant communities are gradually changing, but there are exceptions, for example when physical environments are suddenly changing

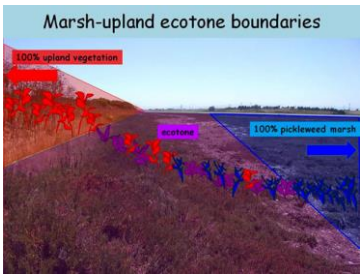
Scale of view is important

Plant communities, boundaries and ecotones



An **ecotone** is a transition area between two biomes. It is where two communities meet and integrate. It may be narrow or wide, and it may be local (the zone between a field and forest) or regional (the transition between forest and grassland ecosystems). An ecotone may appear on the ground as a gradual blending of the two communities across a broad area, or it may manifest itself as a sharp boundary line.





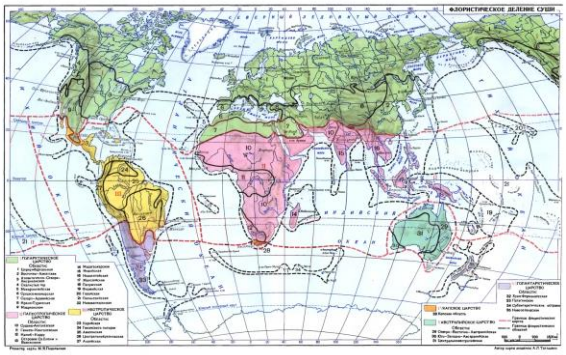
Preamble — Basic terms and concepts

Vegetation refers to assemblages of plant species and the ground cover they provide. It is a general term, without specific reference to particular taxa, life forms, structure, spatial extent, or any other specific botanical or geographic characteristics.

Flora is the plant life occurring in a particular region or time, generally the naturally occurring or indigenous—native plant life.

Floristic composition

- Flora of plant community – floristic composition
- Flora of scots pine forest formation – coenoflora
- Flora of landscape – partial flora
- Flora of larch biome – regional flora



Flora of plant community – floristic composition

- Vascular plant (angiosperm, gymnosperm, fern, horsetail, club-moss

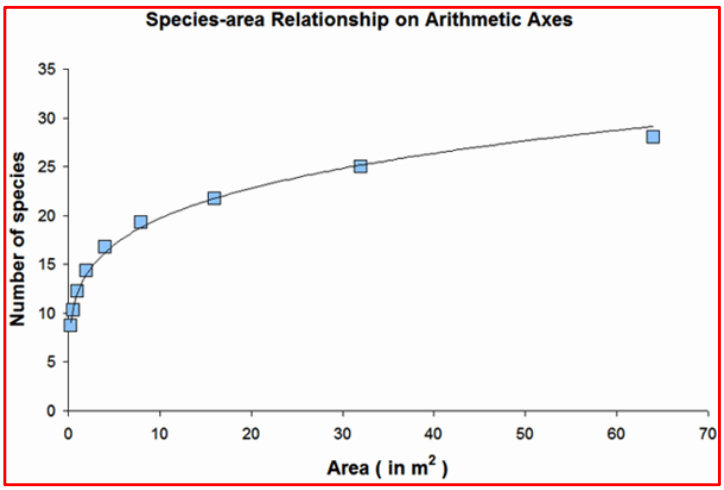
- Moss and liverwort

- Lichen

- Fungi?

- Ground algae?

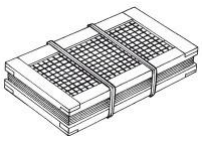
Species richness – alpha diversity



Plant community's floristic composition area of detection

- Tropical forest – 100 × 100 sq m
- Boreal forest – 20 × 20 sq m
- Steppe – 10 × 10 sq m
- Meadow – 4 × 4 sq m
- Certain of types mire – less than 1 × 1 sq m

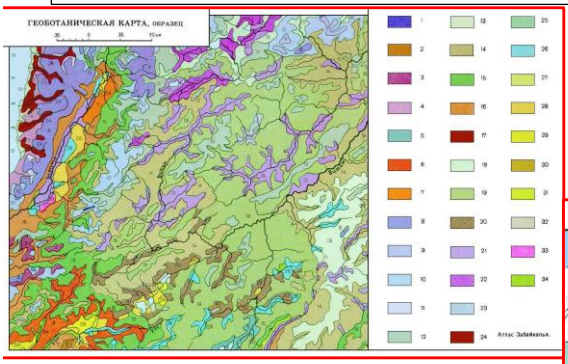
Herbarium – method of documentation of floristic data

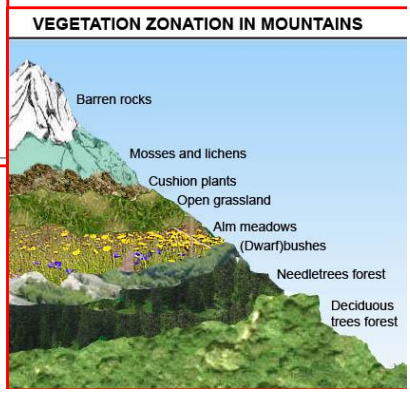


Herbarium of Tomsk State University

Vegetation structure (!)

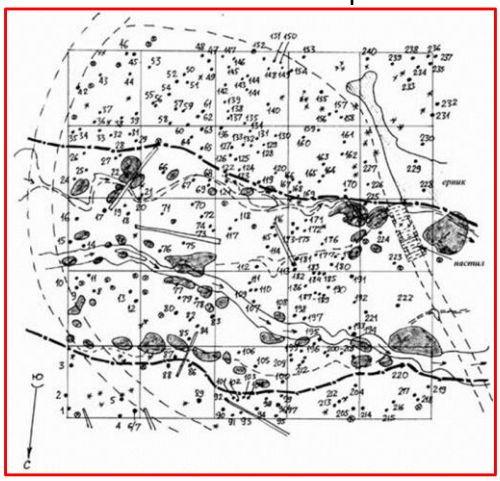
Altitudinal and spatial structure of plant cover





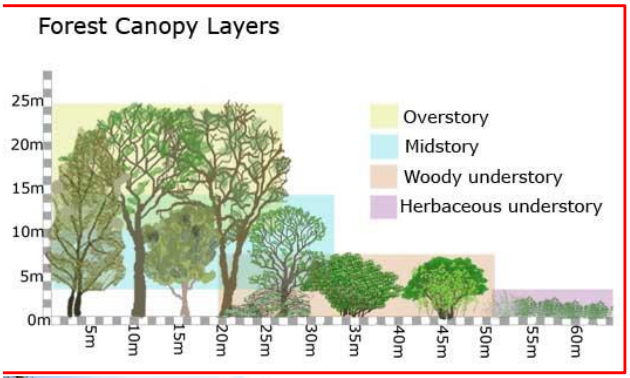
Structure of plant community

Sample plot is basic method of field survey of structure of plant communities



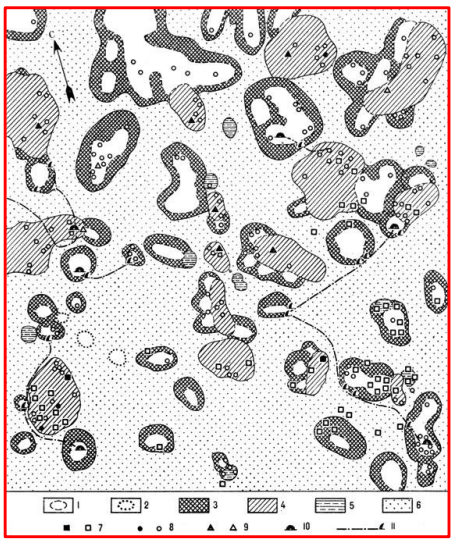
Structure of plant community

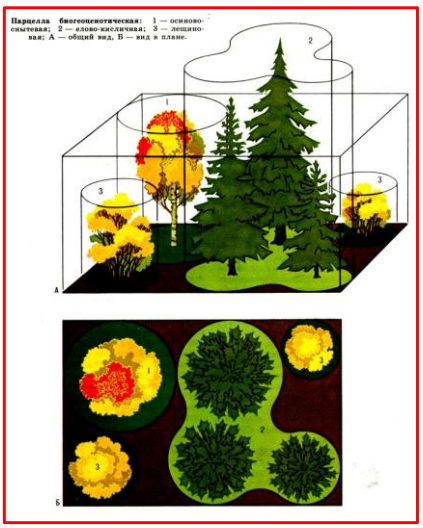
Vertical structure of plant community



Structure of plant community

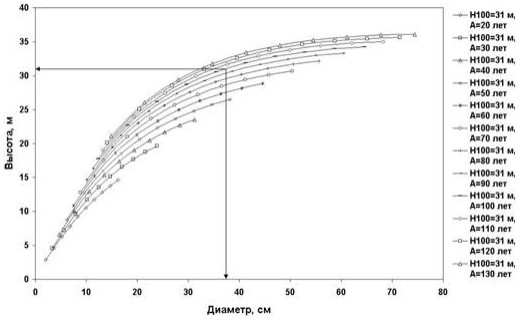
Horizontal structure of plant community





Biomass analysis

Phytomass of tree and shrub layers: method of sample (model) tree



Sample tree must have: mean diameter, mean height of tree and mean height of beginning of crown

Trunk mass

Trunk volume × wood density

Biomass analysis

Phytomass of tree and shrub layers: method of sample (model) tree

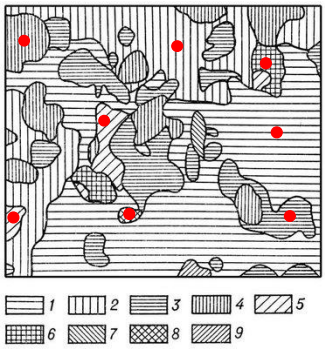
processing sample tree

weighting branches mass

- Mean branches from upper, middle and lower parts of crown
- Weight of branch + weight leaves (needles)
- Samples for humidity

Biomass analysis

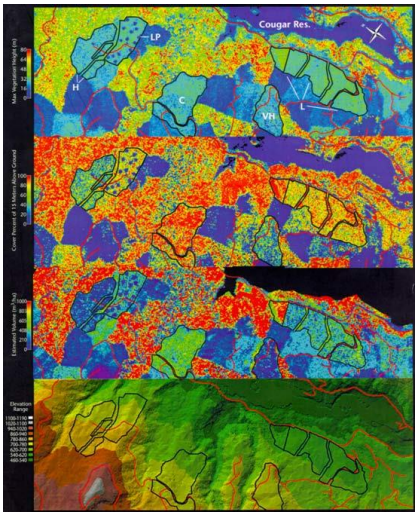
Phytomass of herb and moss-lichen layers:

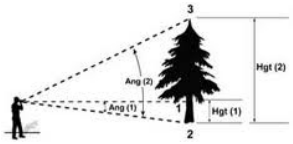


Not less 5 replications for each parcel

Biomass analysis

Growing stock analysis by laser-location method





Laser altimetr

Biomass analysis

Method of root structure analysis

Types of root system of herbaceous plant

Structure of tree root system

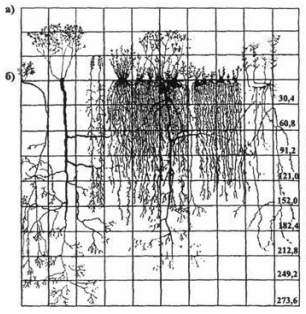
Biomass analysis

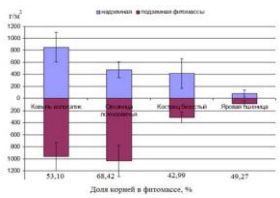
Methods of underground phytomass analysis

(qualitative and quantitative records, allocation pattern)

- Method of trenches
- Method of horizontal excavation
- Method of soil monolith (for example 20×20×20 cm or monolith from soil auger)
- Experimental method of fine roots mass increase

Projection of root system > projection of crown





Biomass analysis

- Method of trenches
- Method of horizontal excavation

Inleakage of humus in ice wedge (fissure)

Biomass analysis

- Method of soil monolith (for example 20×20×20 cm or monolith from soil auger)

Root ablution on the soil sieves

Root samples from soil cylinder

Biomass analysis

- Experimental method of fine roots mass increase (ingrowth cores method)

Шалыт М.С. Методика изучения морфологии и экологии подземной части отдельных растений и растительных сообществ // Полевая геоботаника. М.; Л.: АН СССР, 1960. Т. 2. С. 369-447.

Conclusions

Significant methodological publications

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Conclusions

Reliable field data are foundation of real science!