



CLASSIFICATION SYSTEM FOR ECOLOGICAL STABILITY AND BIODIVERSITY IN FOREST ECOSYSTEMS

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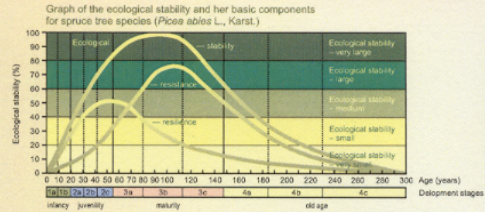
Basic terms and definitions

Ecological equilibrium – a balanced status between the ecosystem and the environment in its certain development moment

Ecological stability – an ecosystem's ability to resist or compensate for both external and internal impacts (without disturbance of functional structure) during a certain time period. The basic components of the ecological stability are resilience and resistance.

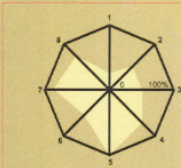
Resilience – is the ecosystem's ability to compensate for external and internal impacts – return to normal ("primal") functional relationships after finishing the influence of disturbance factors.

Resistance – is the ecosystem's ability to resist to internal or external impacts, factors, or influences without a change of the internal and functional ecosystem structure.



Classification system for ecological stability on example of spruce mountain forests

A principle of the method rests on a comparison of the ecosystem stability partial indicators of the real assessed ecosystem and the optimal model ecosystem corresponding to given site conditions in a chosen time interval – short-term (10 year) and medium term (50 year).



- 1 – Species structure
- 2 – Age structure (structure of the development stages)
- 3 – Vertical structure
- 4 – Horizontal structure
- 5 – Mosaic structure
- 6 – Regeneration
- 7 – Static stability
- 8 – Tree species health conditions

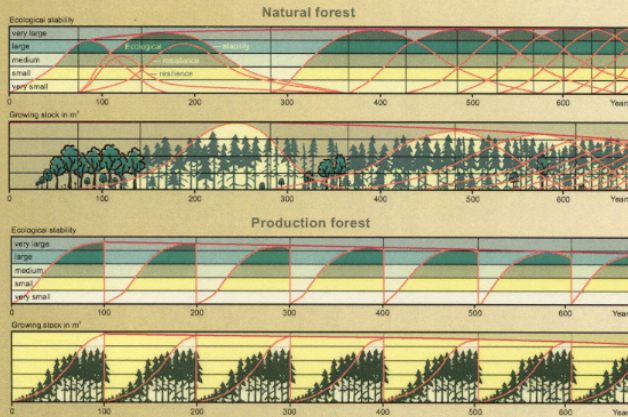
Quantification of the individual indicators of the ecosystem stability is expressed in % (by comparison of the indicators of the real assessed ecosystem and the optimal indicators of model ecosystem in a chosen time interval).

An evaluation of the ecological stability – The modified method of the Sustainable Development index SDI was used. Contrary to SDI, where an average value from the values of the individual partial components of the ecosystem stability is computed, our approach multiplies limit (minimal) value of the partial indicator with an index of ecological stability, which is in correlation with the area in the graph of the ecological stability.



Biodiversity versus ecological stability
Natural and well-preserved forest ecosystems, which are not exposed to disturbing anthropogenic influences, are characterized by a specific species diversity (adequate to given conditions of the abiotic environment) resulting from a long-term synecologic-selective adaptation process. Biodiversity is thus a significant indicator of the nature and stability (resistance) measure of forest ecosystem.

A model of the ecological stability development of natural (succession) and production forest (clear-cutting system) of spruce forest (rowan spruce forest) growing in altitude from 1200 to 1400 m

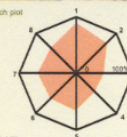
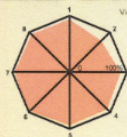
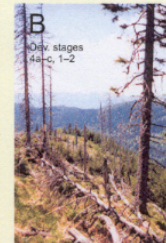


An example of the ecological stability classification (for short-term interval) on two permanent research plots in mountain forests in Slovakia

Both of the plots are in the state of the same conditions and on both of them the same development stages occur.

Assessment of partial indices of ecological stability by above mentioned principles

Values of partial indices of ecological stability (in %)	Permanent plot A	Permanent plot B
1 – Species structure	95	90
2 – Age structure (structure of the development stages)	80	75
3 – Vertical structure	90	50
4 – Horizontal structure	95	45
5 – Mosaic structure	95	65
6 – Regeneration	98	65
7 – Static stability	95	65
8 – Tree species health conditions	95	65
Minimum value (in %)	80	45
Index of ecological stability	0.9971	0.8984
Aggregate value of ecological stability (in %)	79.77	40.43



Graphs of ecological stability