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FOREST SUCCESSION IN TROPICAL LOWLANDS

Summary of Seminar
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Plant succession may be defined as a process which involves the orderly replacement in the course of time of one plant community by another. The different communities that succeed each other form a sere. The replacement usually implies change in floristic composition, physiognomy and structure of the individual communities. The end product of this process, when a relatively stable, although not static, community has been reached, and when changes are difficult to appreciate, is usually called "climax".

In the present study an attempt has been made to reach a set of useful generalizations for "secondary" succession, so called because it takes place in areas where forest vegetation previously existed but had been removed for cultivation.

Materials and Methods.

The forests investigated correspond to 16 plots in Costa Rica and Western Panama all located in areas with temperatures ranging from 23.5°C, to 25.5°C. and rainfall varying from 2000-4000 mm. (80-160 inches). The plots illustrate different successional seral stages and a relatively good knowledge of past disturbance by man was available. Detailed information was obtained for floristic composition, ecological structure and life forms using different techniques but following essentially the recommendations by Richards, Tansley and Watt (1) for analyzing tropical forest communities. An extensive review of literature covering tropical forests throughout the world made it possible to select a series of characters associated with specific seral stages which were tested in the communities examined.

Results

The following characters tested were shown to be valid for the plots examined:

1. The floristic composition of pioneer communities is limited to a few species of wide natural distribution. There is little variation in the species represented in spite of different soil or climatic conditions.
2. The number of strata in a community is highly indicative of its successional status. Few and well-defined strata reveal an early seral stage whereas several strata, difficult to separate, reveal an advanced stage of succession.
3. The absence of large stem diameters is a characteristic of early stages of succession.
4. A dense undergrowth is characteristic of very early stages of development but not advanced stages or the climax.

5. The shape of the upper crowns is highly indicative. Early stages display uniform, thin light-green crowns. Older stages display many variations in crown forms and a darker green color.

6. Intolerance of the dominant species is characteristic of early stages and decreases towards the climax where most of the dominants are tolerant.

7. The evenaged condition is characteristic in early successional stages. There is a gradual change to an unevenaged condition with advance towards the climax.

8. Early pioneer species characteristically have small seeds that are dispersed by wind, birds and bats. Old secondary or climax species mostly have large fruits and seeds, many of which are dispersed by gravity.

9. Deciduousness is characteristic of many of the dominants in communities of intermediate status between the very early and the very advanced seral stages.

10. Seeds of early pioneer species may remain dormant in the forest soil until favorable conditions such as clearing and fire trigger their development.

11. Regeneration of the dominants is common in advanced stages but infrequent or absent in early pioneer stages.

12. Diameter and height growth is very rapid in early pioneer stages.

13. Rapid reestablishment of an advanced stage of the original forest is favored by proximity of such a forest to the disturbed area; redevelopment of the original forest is more rapid in small clearings than in large ones.

14. The presence of dominants having a very short life span is highly indicative of an early stage of succession.

15. The presence of a large proportion of species with leaves of the macrophyll size class, is indicative of an early pioneer stage. Climax species mostly have mesophyll leaves.

16. The hardness and weight of wood is highly indicative of successional position. The wood of trees representing early stages is soft and light whereas in species characteristic of advanced stages the wood is hard and heavy.

17. Climbers are highly indicative. In early stages of successional development, there are few species but many individuals and they are mostly herbaceous, often forming a tangle. In advanced stages of succession, they are large and woody with many species, but are not abundant.

18. An increasing number of species and variety in life forms of epiphytes is characteristic of progressive development towards the climax.

19. Certain species are highly indicative of the successional status of the community. Some can be correlated with past practices, notably exhaustive agricultural or fires. Others, notably palms, are indicative of long undisturbed conditions.

20. On lateritic soils the presence of a community with dominants typical of habitats much drier than the rainfall would indicate for the region, points to past soil degradation, mainly compaction through extensive use of fires.

The results also made it possible to fit different communities into their proper successional sequence whenever they belong to the same sere. It also bears important implications for the silviculture and management of tropical forests.

Literature cited:

1. Richards, P. W. Tansley, A. G. and Watt, A. S. The recording of structure, life form and flora of tropical forest communities as a basis for their classification. *Journal of Ecology* 28:224-239. 1940.