CHAPTER 2

Primary Data

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2.1. Sample Selection

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2.1.1. Introduction

The search and selection of suitable regions, sites, species, and trees are fundamentally important in dendrochronological studies. Practically every dendrochronological study states the locality from which the material is taken and the number of tree rings contained in the samples and the chronologies. However, only in dendroecological papers are the principles of site and specimen selection described (e.g., Mueller-Stoll, 1951; Jazewitsch, 1961; Fritts, 1965; Shiyatov, 1973, 1986; Bitvinskas, 1974; Lovelius, 1979). LaMarche *et al.* (1982) point out the potentials and limits of dendrochronological studies in historical and ecological fields. These depend primarily on the aims and the tasks of the investigator, and their accuracy determines the quality of the tree-ring chronologies obtained. This section focuses on the importance of the sampling strategies for various applications of dendrochronology.

2.1.2. Selection of a study area

The most appropriate regions for dendroclimatological investigations are those where trees grow at their climatic distribution limit and where climatic factors greatly affect tree-ring variability (e.g., northern, southern, upper, and lower distribution limits of forest communities and tree species). However, in many cases

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reliable climatic information may be obtained from growth variations of trees growing under more favorable conditions.

Regions with optimal tree-growth conditions are also well suited for reconstructing such non-climatic factors as competition between species and individuals, forest fires, pest attack, etc. Therefore, at an early stage of study, an investigator should become acquainted with schemes of botanical and geographical subdivision of large territories and with detailed zonation of the study area. The principles of geobotanical zonation are different in various countries, which presents difficulties for a comparative evaluation of general conditions of forest vegetation growth at widely separated regions. Geobotanical characteristics of the large regions, for example, the Soviet Union, may be taken from monographs like *Vegetation Cover of the USSR: Explanations to the Geobotanical Map, Scale 1:4,000,000 1956* and *Vegetation of the European Part of the USSR, 1980.* Most areas of the globe now have some similar broad-scale vegetation descriptions (e.g., Rowe, 1972, for Canada; or Loucks, 1962, for the Maritime Provinces).

2.1.3. Selection of sites

Within the limits of certain regions one may choose sites with the maximum tree growth response to changes in the factors of interest. For example, to study precipitation reconstruction, tree samples should be taken from the driest sites where moisture would most probably be the limiting factor. To reconstruct thermal conditions, the most appropriate sites would be those where trees do not have a limited water supply. Selection of proper sites permits a climatic signal to be revealed in the rings of trees growing in regions optimal for forest development.

This is a principle that at first glance seems to run contrary to statistical considerations requiring random sampling. However, tree and site selection is an extension of the principle of limiting factors, the concept of ecological amplitude and replication. Differences in site lead to differences in the most important limiting factors. Thus, it is important to choose the specific site and to replicate within this site, so that all the sampled trees will have the same or similar signals (LaMarche *et al.*, 1982).

In many areas promising sites for dendrochronological studies are found in mountainous regions, where contrasts may be found in a small territory and where diverse catastrophic factors (such as snow avalanches, mud flows, rock avalanches, glacier advance) greatly influence tree growth. However, dendroclimatic relationships are often difficult to establish here owing to a lack of long climate records and the great variety of microclimatic, mesoclimatic, and macroclimatic conditions. In all areas, site selection for ecological and climatic studies may be influenced by the location of climatic-recording stations. Environmental gradients are examined by selecting specific sites along the environmental gradient (Fritts *et al.*, 1969; Norton, 1983a) and by building strong site chronologies so that any differences reflecting the gradient may be statistically tested. Two general principles should be considered when selecting sites: