Technische Universität Berlin

Institute of Ecology and Biology
m.forstreuter@tu-berlin.de

Phenological observations on bud burst in adult beech stands (Fagus sylvatica L.) of different silvicultural regimes

Manfred Forstreuter & Antje Witt-Wagner

Introduction

In the deciduous temperate trees, the duration of the photosynthetic active period is determined by the timing of spring bud burst and autumn leaf senescence. The timing of the onset and cessation of growth depends strongly on seasonality in the local climate. The photoperiod is known to control the timing of phenological events of various tree species. It is generally assumed that a correct timing has a high adaptive value, especially for the onset of growth. An early beginning of growth may have severe costs for the tree due to late frost damage. On the other hand, a delayed onset of growth may reduce its competitive ability as the growing season is not optimally used and a neighbouring tree may take better advantage of the available resources, and thereby win the competition for space.

Materials and Methods

Investigations were made of seasonal progress in bud burst and leaf flushing on adult beech trees (up to 160 years old) from two 1-ha plots of different management regimes (non-managed n= 152 and managed n=140 trees) of the site Flecken-Zechlin in Brandenburg (Germany). The study focussed on ecological variation and functional diversity of phenology in beech populations. The purpose was to detect the effects of a silviculture regime on the homogeneity/heterogeneity of the phenological traits in beech stands.

Visual observations of the entire crown on adult beech trees were made from the ground by eye and by binoculars at nine dates from 28 April to 13 May 2001. Earlier observations on the same trees were made at six dates from 17 April to 1 May in 2000. Six scales served as a guide for observations on buds of the upper part of the crown (Fig. 1). The scale proposed was used first on young trees and adapted to long distance observations on adult trees.

Results

Bud burst and leaf flushing were illustrated with a phenological emerging index (PEI). Variation of the phenological development within a proper stand was established (Fig. 1).

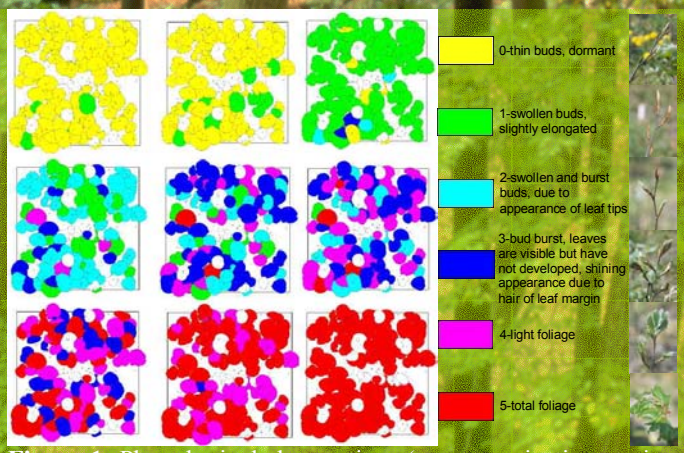

Figure 1: Phenological observations (crown projection at nine dates) on bud burst in a non-managed beech stand at Flecken-Zechlin (Brandenburg) from 28 April to 13 May 2001.

For flushing each tree can be classified as an "early", "middle", "late" or "indifferent" reacting individual to assess the genetic and ecological diversity of the investigated beech forests. The possible effects of management regimes, stand conditions and tree characteristics between the beech plots will be analysed. Phenological observations showed no difference in dates of bud burst between management regimes (Fig.2). Field observations on variation in phenology may improve our understanding of ecological response of forests to the predicted global changes in climate.

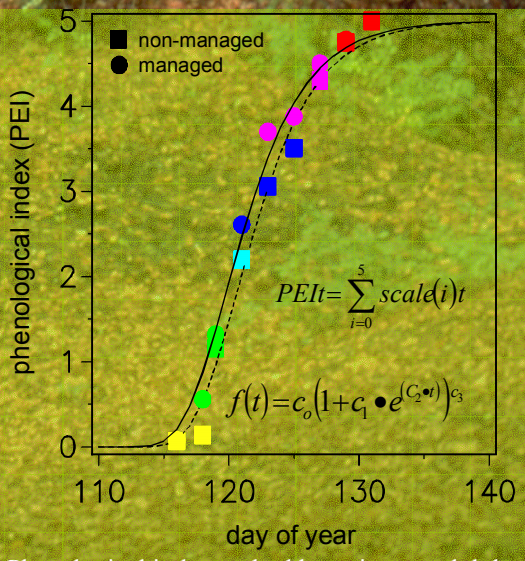

Figure 2: Phenological index on bud burst in two adult beech stands of different silvicultural regimes at Flecken-Zechlin (Brandenburg).

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