

TREE PHENOLOGY MONITORING OF URBAN FORESTS

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INTRODUCTION

Phenology is the study of periodic biological events with relation to climate, particularly seasonal changes like flowering, leaf unfolding (or budburst), seed set, and dispersal in relation to climatic conditions.

Important purpose of observations is to discover meaningful relationships between the meteorological variables and the associated biological responses, crucial not only for predicting phenological responses to climate change but also for identifying the carbon-uptake period and examining the seasonal exchanges of water and energy between land surface and atmosphere (Chen and Xu 2012).

Changes in the timing of life events may be caused by fluctuations and changes in climate, but also by other environmental impacts such as air pollution. Such changes do not only affect the condition of the trees, but also ecological processes at the stand and landscape level (Beuker et al. 2010).

METHODOLOGY

Within the aims of the ICP FORESTS Forest monitoring, Tree Phenology is defined as optional systematic observation and recording of:

- the yearly development stages of forest trees,
- biotic and abiotic (e.g. damaging) events and phenomena.

The main objective of phenological observations on the Forest monitoring plots is to provide supplementary and complementary information on the status and development of forest tree condition during the year.



CONIFERS: NEEDLE APPEARANCE



BROAD-LEAVED SPECIES:
LEAF UNFOLDING



CONIFERS: FLOWERING



BROAD-LEAVED SPECIES:
FLOWERING



BROAD-LEAVED SPECIES:
AUTUMN COLORING



BROAD-LEAVED SPECIES: LEAF FALL

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Tree phenological observations provide important data needed for better land use planning that could reduce the heat island effects and consequently improve the quality of the urban environment (Dhami 2011).

Vegetation indices derived from remotely sensed data provide a powerful way to monitor the urban environment and human activities (e.g. estimation of the urban temperature and its spatial variation).

Tree phenological observations are often organized as the innovative citizen science field campaign using citizen science and public participation as one instrumental method to engage the public, in collecting urban tree phenophases data and to promote the observation and collection of scientifically meaningful environmental measurements particularly for use by urban forest managers. Such data collected could support the long-term research of plant ecology, climate change, public health, urban heat islands on tree physiology, and urban tree management.



Cooperation with other phenological monitoring programs is foreseen (e.g. the International Phenological Garden in Tivoli park in Ljubljana, the only one in Slovenia, established in 1959).

ESTIMATION OF FINANCIAL COSTS

Estimated number of visits to the plot during the average vegetation period (April – October)

- 15 – 18 weekly observations in the periods of leaf / needle flushing and fall;
- 5 -10 biweekly observations of biotic damage (pests and/or diseases) and abiotic damage (e.g. frost, wind, hail).

Minimum 20 visits of plot, 30' - 60' / visit: 10 – 20 working hours / year

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