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History of Lilac Phenological Observations in the USA

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Abstract
The Western Research and Demonstration Farm became a member of the "USA National Phenology Network" in 2008 when a set of cloned lilacs were planted on June 2, 2008. Phenological observations, or the date specific plant growth stages are reached, will be reported to the network and compiled with other observer data from across the nation. These observations will be used for various purposes, some of these uses may include 1) characterize seasonal weather patterns and improve predictions of crop yield, 2) help predict disease or pest outbreaks, and 3) allow the pursuit of more detailed questions of plant responses to global warming at a national scale.

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Introduction

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Background

The first extensive USA phenological observation networks began in the late 1950s with a series of USDA regional agricultural experiment station projects, designed to employ phenology to characterize seasonal weather patterns and improve predictions of crop yield. J. M. Caprio at Montana State University began the first of these projects in 1956, and it eventually included around 2,500 volunteer observers distributed throughout 12 western states. Common purple lilac plants (*Syringa vulgaris*) were observed initially, with two cloned honeysuckle cultivars (*Lonicera tatarica* 'Arnold Red' and *L. korolkowii* 'Zabeli') added in 1968. Lilacs are not invasive, and thus they are acceptable for widespread distribution in a phenology network. However, honeysuckles are considered invasive, and no new plants have been distributed as part of USA phenology networks since the mid-1990s. Most observations in the western USA network ended in 1994; however, a few observers have again reported data since the later 1990s. Initially, only the dates of "first bloom," "full bloom," and "end of bloom" were recorded, with dates of "first leaf" and "95% or full leaf" added in 1967. These events were all precisely defined for the observers with verbal descriptions and photographs.

Encouraged by the success of Caprio's program in the western USA, similar projects were started in the central U.S. in 1961, and in the northeastern U.S. in 1965. All five events (phenophases) described above were recorded for plants in the eastern USA networks from the start. Both of these networks observed cloned plants of the lilac cultivar *Syringa chinensis* 'Red Rothomagensis' and the same two honeysuckle cultivars used in the western states project. The cloned lilacs are sterile (in that they do not produce seeds) and are non-invasive. In 1970, the eastern networks were combined and expanded to about 300 observation sites. Between 1975 and 1986 observations continued under several additional projects, but the eastern network lost funding and was terminated at the end of 1986. After the "decommissioning" of the eastern USA network operations by the USDA, the author corresponded with the most recent network supervisors, who granted me permission to contact the observers and to invite them to continue participating in an "interim" network, pending new funding. Approximately 75 observers responded to a renewed survey form sent out in March 1988, returning data for 1988 and in many cases 1987 as well. From that time to 2004, the author continued to operate this interim "Eastern North American Phenology Network" with approximately 50 observers

reporting lilac and/or honeysuckle event dates each year.

Recent Events

Starting in 2005, these existing lilac observation stations were reorganized into an "Indicator Observation Program" and combined with a new "Native Species Observation Program" to form the prototype "Plant Phenology Programs" of the developing USA-National Phenology Network. The historical lilac phenology data from these networks (Figure 1), are publicly available online. In summary, the historic lilac-honeysuckle network provides spatially extensive spring phenology information from the late 1950s in the western USA and early 1960s in the eastern USA. Despite varying lengths of station observation records over this period, these data are sufficient to establish the general relationship among spring phenology, spring temperatures, and spring runoff. Station density is highest in the western and northeastern portions of the country, allowing more detailed analyses of patterns in those regions. Phenology network stations are not present in the southeastern USA, as lilacs and honeysuckles do not receive sufficient chilling to grow successfully in that region.

Applications

Much of the work accomplished using these phenology data involved the construction of models, which when driven by climate data can compensate for spatial and temporal gaps in network coverage. However, such models are then no longer independent of the climate data, and are less flexible in determining new or changing relationships between climate and phenology. Also, the advantage of clonal plants limits their ability to directly address interesting questions related to how native plants differentially respond to changing climate. The developing USA National Phenology network (USA-NPN) is actively expanding clonal plant observation sites across the continental USA and Alaska (lilacs don't grow in Hawaii) as well as instituting similarly widespread observations of native plant phenology to allow the pursuit of more detailed questions of plant responses to global warming at a national scale.

Future Plans

A constraint of the existing USA lilac network is simply the limited number of stations. However, the recent linkage of the lilac network to the USA-NPN, more than doubled the number of observers since 2006 (from 60 to more than 120). In addition, the number of potential observers in 2009 and beyond (i.e., those who have registered with USA-NPN to-date and requested cloned lilacs) has already risen to levels similar to the high-point of the legacy network (more than 500). Given that full-scale efforts across the entire country have not yet been employed to recruit new observers, the USA-NPN results so far strongly suggest that a future lilac network of 2,500 stations nationwide is obtainable. If you are interested in finding out more and possibly participating in the USA National Phenology Network, please visit www.usanpn.org.

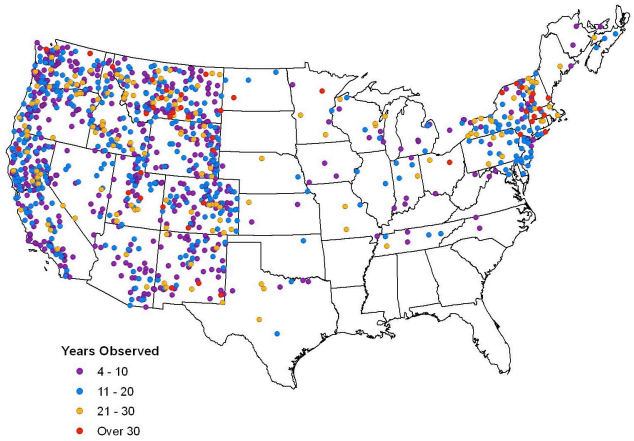

Figure 1. Years of observations for North American Lilac Phenology Stations, 1956-2003 (the pattern for honeysuckle locations is similar).