



National and international organization of phenology as a tool for science, management and education in a changing environment

Ellen Denny, Jake Weltzin, Theresa Crimmins, Carolyn Enquist, and Alyssa Rosemartin
USA National Phenology Network, United States (ellen.denny@yale.edu)

Patterns of phenology for plants and animals control ecosystem processes, determine land surface properties, control biosphere-atmosphere interactions, and affect food production, health, conservation, and recreation. The USA National Phenology Network (USA-NPN; www.usanpn.org), established in 2007, is a national science and monitoring initiative focused on phenology as a tool to understand how plants, animals and landscapes respond to climatic variability and change. Core functions of the National Coordinating Office (NCO) of USA-NPN are to provide a national information management system including databases, develop and implement internationally standardized phenology monitoring protocols, create partnerships for implementation, facilitate research and the development of decision support tools, and promote education and outreach activities related to phenology and climate change. USA-NPN has a number of new tools to facilitate science, management and education related to phenology at local, regional and national scales. The information management system includes an advanced on-line user interface to facilitate entry and download of contemporary organismal phenology data into the National Phenology Database, access to important historic phenology datasets, and a metadata editor for description, registration and search of phenology datasets. An integrated animal and plant phenology monitoring program provides internationally standardized methods and monitoring protocols for over 400 animal and plant species, with additional species added upon demand. Monitoring methods are designed to facilitate collection of sampling intensity and absence data for both plants and animals, and the interface enables the capture of considerable metadata (at granularities including observer, site, organism, and observation). National scale, in-situ observations since 2009 are now available for land product parameterization and validation, and USA-NPN is participating in the Committee on Earth Observation Satellites (CEOS) Land Product Validation (LPV) Phenology Focus Group. Partnerships with a variety of other organizations benefit from recent development and distribution of standard operating procedures (SOPs) and web services with data input and output functions. USA-NPN facilitates research and the development of decision support tools through provision of communication, coordination and collaboration in a data-rich environment. Education and outreach are facilitated by new on-line training materials, in-person and distance workshops, and a strategic education plan in development. Finally, USA-NPN is collaborating with other national phenology networks around the globe to create an international community of practice for phenology within the collaborative infrastructure created by Group on Earth Observations (GEO).