



# The California Phenology Project

*Tracking nature's pulse to assess climate change response across California landscapes and national parks.*

## Background

Phenology is the study of seasonal or periodic biological events such as flowering, leaf-out, insect emergence, and animal migration. The dynamic seasonal status of plants and animals (i.e., the timing and intensity of phenophases) is closely linked to ecological and climatic variables, and provides an integrative signal of environmental quality. Phenology has been recognized by the Intergovernmental Panel on Climate Change as a key indicator of biological responses to climate change, and by several national assessments as perhaps our best opportunity to detect the impacts of climate change on our natural resources.

Compelling to observe and simple to record (through a standardized system developed by the USA National Phenology Network), phenology offers a common framework for professional and citizen scientists of all ages to connect with the dynamic pulse of our planet through direct engagement in scientific observation, thereby providing an accessible platform from which to educate the public about climate change.

**The California Phenology Project (CPP)** is in the initial stages of developing an integrated phenological monitoring program. The project incorporates public education and outreach along with sound scientific practices and outcomes to inform natural resource management, for 19 National Park Service (NPS) units in California. Project work initially will be conducted in six pilot parks, representing five park networks, and is building upon existing monitoring protocols and programs of project collaborators: the Phenology Stewardship Program at the University of California, Santa Barbara (UCSB-PSP), the US Geological Survey (USGS), and the National Coordinating Office of the USA National Phenology Network (USA-NPN). The project also emphasizes and encourages partnerships with the wider education and natural resource science communities including the University of California Natural Reserve System, sister federal and state agencies, and others.



California's dynamic wildflower blooms, like this hillside of *Clarkia* (farewell-to-spring) in the southern Sierra Nevada Mountains, support activities of pollinators, scientists, nature enthusiasts, and ecotourists. Photo: Brian Haggerty.

## Purpose & Scope

The primary goal of the CPP is to organize and implement integrated phenology monitoring projects under a collaborative science framework across California parks and partners. The project will assess how phenology can best be used to monitor the response of natural resources to climate change across California's diverse landscape. Initially focused on plants and open to public participation, the CPP also aims:

1. to develop a monitoring framework, target species list, and sampling scheme that can support the participation of 19 NPS units, UC Natural Reserves, and other partners and landscapes in California;
2. to establish science and interpretation frameworks that can be applied to long-term timeframes;
3. to cultivate phenological and climate change literacy among scientists and the public through coordinated training and educational materials developed for participation in phenology monitoring projects; and
4. to identify and summarize legacy phenology datasets in California to provide a historical context for current monitoring and educational activities.

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### Scientific Approach

A workshop was convened in November 2010 to develop an initial science framework that supports: the development of tractable ecological questions; target species selection; design of sampling schemes; and the creation of training tools, monitoring materials, activities for park visitors, and curricula for park-associated informal science education programs. The science framework and ecological questions developed by the CPP:

- will enhance our understanding of species-specific and community-wide responses to climate change across coastal, mountain, and desert landscapes;
- outlines a decision-making process for regional (across parks) and local (within parks) implementation;
- can be addressed by phenological monitoring and through a combination of regional and local environmental gradients (e.g., elevation, precipitation, disturbance);
- is conceptually engaging and appealing to the public; and
- can inform natural resource management practices that are vital to the National Park Service mission of maintaining the biological diversity and ecosystem function of its lands.

### Implementation

The California Phenology Project was started in fall 2010 and a core project coordination team has been convened with representatives from each pilot park and the principal project partners. Development and testing of scientific and education/outreach protocols is planned for the 2011 and 2012 field seasons in six pilot parks (Golden Gate NRA, Joshua Tree NP, Lassen Volcanic NP, Redwood N&SPs, Santa Monica Mountains NRA, and Sequoia and Kings Canyon NPs). A series of project briefing webinars is planned for the December-January time period to brief all potentially-involved NPS science and interpretation staff on the project – with an emphasis on securing engagement of NPS interpreters in the project.

Concurrently three biogeographically-based work-



The California Phenology Project is integrating phenological monitoring and interpretation activities across 19 NPS units - including 6 pilot parks - spanning five Park networks and desert, coastal, and mountain biogeographic regions.

groups are being established: Desert Parks, Coastal Parks, and Mountain Parks. Natural resource and interpretation representatives from all 19 CA NPS units are invited to participate in these workgroups since we will be selecting species and establishing the monitoring and outreach framework for all parks at the start of the project. These teams will develop an overall project science and outreach implementation plan for each of the three biogeographic areas. On-the-ground testing of science and outreach protocols will be conducted by NPS seasonal technicians in coordination with pilot park ecologists, interpreters, and UCSB and USA-NPN project partners.

### Desired Outcomes

- Extensive participation in phenological monitoring by scientists, educators, students, and the public through NPS pilot parks and partners.

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- Demonstrated value of phenological data, especially to natural resource managers, including linking existing monitoring efforts (e.g., Inventory & Monitoring) to phenological patterns.
- Cultivate phenological literacy and enable people to see effects of climate on our natural resources in the short-term (within seasons) and long-term (across seasons and years).
- Development of a sophisticated but easy-to-use phenology toolbox of science and outreach protocols, tools and products (everything a park needs to engage in phenology monitoring).
- All resulting products, protocols, tools, data and documents made freely available online and electronically.
- Identification and collation of legacy data from NPS units, UC reserves, and partners.
- Solicitation of additional funding to enhance current activities and facilitate the continued development of a California Phenology Network.



A group of NPS staff, citizen scientists, professional scientists, and educators discuss links between native plant and insect phenology at a “Phenology & Climate Change” workshop, led by UCSB collaborators at Santa Monica Mountains National Recreation Area. Hands-on training workshops for NPS staff and project partners, tailored to the California Phenology Project biogeographic regions and NPS units, will take place during the project. Photo: NPS staff.

## More Information

Project website: <http://www.usanpn.org/cpp>

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Clarkia in full bloom as grasses “brown-down” into summer. Kern River Canyon, Sierra Nevada Mountains. Photo: Brian Haggerty.

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