

**Opportunities for Developing Phenology-based Climate Change Interpretive,
Education, and Citizen Science Programs in California National Parks:
A survey of current park resources and capacity for implementation**

November 2011

Compiled by

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for the

California Phenology Project

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Introduction:

The California Phenology Project (CPP; <http://www.usanpn.org/cpp>) is a collaboration between the National Park Service, the Phenology Stewardship Program at the University of California, Santa Barbara (UCSB-PSP), and the National Coordinating Office of the USA-National Phenology Network (USA-NPN) to design and to develop a scientifically sound phenological monitoring program for 18 National Park Service (NPS) units in California (Figure 1) and one in Nevada. The CPP was initiated in 2010 with funding from the National Park Service (NPS) Climate Change Response Program (CCRP). Initial project activities focusing on monitoring phenology of plants are being conducted in six pilot parks from 2011 to 2013. The pilot parks are Joshua Tree NP, Santa Monica Mountains NRA, Sequoia and Kings Canyon NP, Golden Gate NRA, Redwood NP, and Lassen Volcanic NP.



Figure 1. Map showing location of NPS units participating in the California Phenology Project.

A significant component of this project is centered on development and testing of education and outreach to enhance public engagement and understanding of climate change. Tools and materials resulting from the CPP effort will be available for use by park staff to inform and engage park visitors, volunteers, school groups, and educators in phenological monitoring to detect and to measure the effects of local climate and of climate change on the onset and duration

of growth and reproduction in wild plants. At the end of the pilot effort, scientific and outreach protocols, tools, and materials will be available to all parks via a user-friendly web interface.

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, native plant societies and others.

In an effort to identify ways to integrate climate change education and phenological monitoring most easily into current and prospective education and interpretive activities at each park, the CPP project team invited each of the 19 NPS units to inform us about its existing education, interpretive and volunteer programs. This report aims to consolidate and to synthesize this information

Methods:

A total of 41 interviews (1 to 2 hours each) were conducted with NPS interpretation and/or resource management staff at all 19 participating parks between February and May 2011. Interviews were conducted either in person or via conference call. Interviews were scheduled and conducted by project cooperators Margot Higgins (UCB), Liz Matthews (UCSB) and Susan Mazer (UCSB). Each of the interviewees was contacted by e-mail and sent a list of guiding questions prior to the interview (Appendix A). Thank you e-mails were sent following the interview.

The interviews were aimed at people who had been appointed as the park Natural Resource or Interpretation Point of Contact for the NPS California Phenology Project. A number of other park employees also participated in the interviews, including but not limited to those involved in education and volunteer programs. Most of these contacts already had some familiarity with the California Phenology Project and many had already attended CPP briefing conference calls or webinars held in late 2011 and early 2011. Additional contacts were identified through the interview process and these individuals are listed at the end of each park report.

The aim of the interviews was to gain an understanding of the following for each park:

- 1) the type and scope of existing education, outreach, volunteer, and interpretive programs, as well as each park's previous experience with climate change education programs or those related to monitoring or natural history;
- 2) the identities of park staff active in interpretation or outreach;
- 3) current interpretive programs or activities that may integrate phenological education and monitoring;
- 4) level of interest in phenological monitoring and associated citizen engagement;
- 5) opportunities to connect phenology with existing park efforts and to hear from each park about how the CPP pilot project could best meet long-term needs for climate change related education/outreach activities;
- 6) existing citizen science and volunteer programs and activities;
- 7) staff motivations, needs, preferences, opportunities and constraints;
- 8) relevant physical locations for phenological monitoring; and

- 9) relationship with local communities and the general characteristics of park visitors.

Information obtained through the interviews was compiled and summarized in individual reports for each of the 19 NPS units on the following pages. The names of individuals interviewed are listed at the top of each park summary report along with their contact information. Due to the great variation in programming and staff among the parks it was not possible to maintain consistent content and categories for each park report. For example, not every park has the staff or resources to provide volunteer programs. Nevertheless, the main summary for each park includes a “best opportunities for phenology” section that describes the program(s) into which phenological education or monitoring may most easily be introduced and integrated.

Individual park summary reports were then reviewed by the project team to identify a set of recommended actions to enhance integration of phenological monitoring and climate change education into park interpretation and education programs. These recommendations will be vetted with park staff prior to making final decisions on specific actions for the CPP team to focus on.

Recommended Actions:

Based on the findings of this report we make an *initial* recommendation that the CPP develop the following menu of tools to assist with the integration of phenology into park interpretation and education programs.

- 1) A general outline for phenological talks that can be adapted for evening or trail-based ranger talks, depending on the current expertise and resources of park staff.
- 2) Phenology demonstrations (including labeled plants and data sheets that rangers can guide visitors to complete) near park visitor centers where visitor traffic is high.
- 3) A guide to creating native plant phenology gardens inside parks and in surrounding communities.
- 4) Information and contacts for current work in the development of i-phone applications for phenology.
- 5) Suggestions for the contents of traveling trunks that will facilitate the teaching of phenology (and its application at nearby parks) at local schools.
- 6) Provide PowerPoint presentations that summarize the importance of phenological monitoring and its link to climate change; the species targeted for monitoring in each park; and the basic botanical and record-keeping skills necessary for successful monitoring.

Cabrillo National Monument (CABR)

Individuals Interviewed

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Best Opportunities for Phenology:

The best opportunities for phenology seem to be with the existing weekly Coastal Sage Scrub Hike interpretive program, The Native Plants/Native Peoples education program, and the annual Parks and the Open Spaces Day Festival.

General Notes on the Park:

Park staff at CABR are enthusiastic about phenology. The park has a small Natural Resources staff. These staff seem to have a good idea of what phenology monitoring entails, however, they have expressed interest in having support in the form of phenology training sessions (including basic botany) and assistance with phenophase definition development for park species.

The interpretive staff would also benefit from focused training. Most enjoy the natural resources of the park, but they may not have the background to conduct the monitoring that is required by Nature's Notebook. It would be very useful for park staff to participate in a training workshop provided by the California Phenology Project (perhaps when conducted at a nearby pilot park), and it was mentioned that many of the staff would become valuable contributors if given this training.

Interpretive Programs:

Coastal Sage Scrub Hike: this outdoor program involves a 1-2 mile hike and is typically held 1-2 times per week. It is generally one hour in length and runs from 3:30 to 4:30 pm on selected week and weekend days. The hike is followed by a ranger led discussion with a free flowing Q&A session. This program involves two rangers (one from Interpretation, one from Natural Resources) and is offered to 1 – 10 visitors at a time. The program includes a general introduction to Coastal Sage Scrub ecology and Native American ethnobotanical uses. Phenology is one of the topics that is covered during the hike.

Parks and Open Spaces Day Festival: This is an 8-hour annual event that usually occurs on a weekend day. The program is held mostly indoors and consists of information booths and lectures. It includes eight rangers (+/-) (four from Interpretation, four from Natural Resources)

and hundreds to thousands of park visitors. The program includes a wide range of environmental topics covered by various organizations whose interests range from advocacy to phenology to history to academic research (Introduction to Coastal Sage Scrub Ecology, Marine Mammal Acoustics, etc.).

Education Programs:

Native Plants/Native Peoples: This program is held once a year over four consecutive weekdays with each day's programs lasting about 2 hours. This program is held indoors and outdoors; rangers go to an elementary school for two days and give presentations to children, then the children come to the park and go on a one-mile trail hike and spend time in the nursery. The program involves three rangers (two Interpretation, one from Natural Resources) and is offered to 20-30 children at a time. The program includes a general introduction to Coastal Sage Scrub ecology and Native American ethnobotanical uses. Phenology is covered in a general sense. Children learn about greenhouse techniques and construct "native seed bombs."

Volunteer Programs:

There would be opportunities for volunteers to work on monitoring projects; however these programs would need to be carefully designed. CABR only has two real trails and no "off-trail" opportunities, so any monitoring areas would need to be accessible from one of the two trails. An additional complication is that several of the proposed species are not visible or accessible from these trails.

Phenology Requests:

The park is very interested in a smart phone application that visitors and staff could use to record phenological events. An application similar to the "What's Invasive?" application would work, as suggested by park staff. One problem at CABR, however, is the limited cellphone reception that exists in many parts of the park. Many of the current applications may have the ability to record the data and then forward it to the server once cell reception is achieved.

Channel Islands National Park (CHIS)

Individuals Interviewed:

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Best Opportunities for Phenology:

Integrating phenology with education programs on the mainland. Park staff collaborate with an extensive network of local non-profits, schools and government agencies on a variety of education and outreach activities.

General Notes on the Park:

Bringing members of the public to this island-based park is relatively difficult, as it generally requires travel by boat. These trips are also weather dependent. While the park staff seemed very supportive of phenology as a concept, the interpretive staff did not think it is feasible to have citizen scientists on the ground each day, or even once a week. The CHIS visitor center is on the

mainland, however, and there may be more opportunities for phenology related activities there. CHIS has a large population base and park staff are very interested in expanding outreach with the community.

There is a UC Natural Reserve on Santa Cruz Island. Lyndal Laughrin is the reserve director and has lived there for 30 years. He oversees an unknown number of volunteers.

Susan Mazer and Brian Haggerty of UCSB offered several workshops at Santa Monica NRA (SAMO) that park representatives attended (along with school teachers and USFWS staff) in the fall of 2009. CHIS Park staff members have worked closely with SAMO, and the two parks exchange a lot of information with one another.

Park staff was very knowledgeable about how to integrate educational material offered in the park with California curriculum standards.

Interpretive Programs:

There is opportunity to introduce phenology as part of an evening lecture series offered at the park. CHIS staff offer public programs from the Visitor Center at 11:00 am and 3:00 pm on Saturdays and Sundays. Afternoon talks are usually on different topics, so phenology could be introduced into these offerings.

Ranger Talks are conducted at the mainland visitor center and on the park islands. Interpretive hikes are conducted on all islands for most concession trips by volunteers that are part of a joint program between the National Park and National Marine Sanctuaries. Climate change is included as a topic in guided walks and evening programs. Nearly all visitors that arrive via concessioners to all five of the park island are offered interpretive orientations, guided walks or hikes, and on some islands evening programs. These programs are provided by park rangers, trained naturalists, or concession staff. Rangers develop their own programs. Programs are provided to volunteers and park guides to deliver. The park has been making effort to focus on climate change in all interpretive programs and media.

Education Programs:

The park website offers resources for teachers such as descriptions of programs and activities appropriate for different age groups: <http://www.nps.gov/chis/forteachers/index.htm>

Visitor center programs: The park offers curriculum-based education programs to K-12 students. Most of these programs requested are for grades 1-6 but they also offer some pre-kindergarten activities.

In-class programs: Park education staff provide seven to eight classroom programs that are aligned to different curriculum content standards. At this point, these programs are not connected to climate change. The most frequently requested programs are for lower elementary school (Grades 1-4).

CHIS offers education programs through *Island Packers*, which is an official NPS concessionaire located in Ventura Harbor and Channel Islands Harbor (<http://www.islandpackers.com/>). Island Packers leads school groups on visits to the islands, boat trips, and whale watching trips. Their education coordinator is Andrea Mills (805-642-1393).

The park has a long-standing and expanding program called Scientists-in-Training to provide high school and college students experience in citizen science through plant restoration efforts. Presently participants come from environmental clubs and biology classes at seven high schools and two community colleges.

The park has good channels of information distribution through a partnership with the Ventura County Office of Education (VCOE). The listserve includes educators (formal and informal) that post and receive resources. The majority of these educators are from Santa Barbara, Ventura, and LA counties.

CHIS has a cooperative agreement with VCOE called “*Channel Islands Live*” that involves distance learning education programming delivered live and interactive from the remote islands to classrooms on the mainland via the Internet and videoconferencing. .

The program offers live hikes, a live dive through the kelp forest, and many other topics. These programs are curriculum-based, live and interactive. Archival programming can be accessed via the web. Live hikes and dives include discussions of different topics. Programs directed towards general public audiences are also presented.

Channel Islands Live also includes two live webcams. One is on Anacapa Island and the other is directed at a bald eagle nest on Santa Cruz Island. Phenological education and announcements of current phenological events, activities, and training opportunities could be incorporated into this kind of programming. See: <http://www.nps.gov/chis/planyourvisit/channel-islands-live-nps.htm>

Volunteer Programs:

The park has volunteers who lead guided hikes for visitors.

The *Channel Island Naturalist Corps* (http://channelislands.noaa.gov/edu/edu_natc.html) is a volunteer group that is highly competitive to get into and consists of 150 people. The majority of this group is retired, but there are people of all ages. The volunteers come from a wide variety of backgrounds and include doctors, lawyers, students and specialists. David Begun and his counterpart at Channel Islands National Marine Sanctuary, Shauna Bingham (Shauna.Bingham@noaa.gov), coordinate this group.

Volunteers also work in *native plant gardens*. The volunteers in the gardens might be open to including phenology in their programs, even though native plant gardens are watered and therefore the timing of phenological events is likely to differ from that seen in native plants on the islands. The garden is being assisted by the county master gardeners program.

Staff at the *Santa Barbara Botanic Garden* (SBBG) helped develop the park's native plant garden years ago and continue to work on park projects, many of which happen with park resource management staff. The park hosts a yearly native plant garden tour offered by the *California Native Plant Society*. A good contact at the SBBG is Steve Junak, a well-known botanist who has conducted plant surveys for most or all of the eight Channel Islands, including those owned and managed by the U.S. Navy.

The *Channel Islands Restoration* program (CIR; <http://www.channelislandsrestoration.com/>) is a local a non-profit group based in Santa Barbara. They have a cooperative agreement with the park. They are doing lots with restoration, particularly with ice plant removal. The park superintendent's goal is to have East Anacapa Island free of the ice plant by 2016 NPS anniversary. CIR is funded mainly by grants and they attract a mix of general public, citizen science and school groups (grade 4 and above – no younger groups). Ken Owen is the Executive Director, and Araceli Dominguez is the Volunteer Coordinator. *When the CPP offers additional workshops at SAMO, the CIR should be contacted to distribute invitations to its volunteers.*

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The *Nature Conservancy* (TNC) is also involved in the Santa Cruz Island Preserve Project, where phenology might be incorporated. Mike Alstead is the main contact at TNC (need to confirm).

Phenology Requests:

If there is an outline developed for ranger talks based on phenology, park staff would like to have a copy and modify it for the Channel Islands. It is possible that they could train volunteers to give a phenology talk.

Other Contacts:

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Death Valley National Park (DEVA)

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Best Opportunities for Phenology:

The existing and upcoming education programs being developed by Stephanie Kyriazis, especially the Climate Change in the WILD West and Death Valley ROCKS programs, may be open to adding phenological themes. There is also the potential to integrate phenology with the activities of the maintenance crew and to set up a phenological monitoring trail at the new visitor's center and within the higher elevation trails in the park. The best time for training would be in the fall, when the regularly scheduled interpretive training program is held.

General Notes on the Park:

DEVA is extremely short of interpretive staff. They would need a seasonal person to coordinate with interpretation to develop a phenology program.

The visitor center is currently closed and in the process of renovation. Completion is expected in early- to mid-2012. At the moment, the front desk staff is located in a temporary trailer. They are also constrained by the large size of park, which is 200 miles long and 3.4 million acres.

Interpretive Programs:

DEVA conducted climate change training for regular interpretive staff in fall 2010. This interpretive training for winter seasonal rangers always takes place in the fall.

Death Valley Natural History Association does not do anything explicitly in relation to climate. They may do workshops occasionally. They periodically run field trips but these tend to be geological or mining-based.

Resource Management Programs:

Most natural resource management is focused on weed management surveys and NEPA compliance. Jane said it will be difficult for resource managers to identify a reliable location for repeated phenological monitoring in the park. For example, she visits a given part of park only once a year. In the main visitor center there are creosote and mesquite in the native landscaping, but it is not accessible at the moment. According to Jane, they do not have an existing resource management program that would easily integrate phenological monitoring, although Stephanie seemed to suggest that there are many opportunities within the education programs. Nevertheless, Jane said they do have quite a bit of rainfall monitoring in the park, which could tie in with phenology. They do not have many accessible plants that can be visited frequently by trained personnel. Weed management is their biggest “crisis.” There are 100 weeds in the park, and some have the potential to destroy a huge part of the park, such as the Sierra region.

In spring the park conducts early monitoring for weeds. They often do not find things like Sahara mustard until it is fully in fruit. This spring they are monitoring rare plants at Eureka Dunes. All winter they work hard to test treatments and retreat sprouts. They will be mapping population extent and density. They are hoping to do rare plant monitoring this summer.

One option would be to obtain a list of the five invasive plants of greatest concern at the park, and request that the NPN provide new profiles for these species (unless some are already on the NPN target list). Instructions for identifying and recording the phenophases for these species (based on their growth forms) could be included in the generic Phenological Monitoring Guide produced for the non-pilot parks.

Education Programs:

The park website offers descriptions “for teachers” of programs and activities appropriate for different age groups: <http://www.nps.gov/deva/forteachers/index.htm>

Overall, park staff work with more than 2000 students per year, approximately 500 of whom visit the park for multiple days of education programming. Education programs typically run from late October through April, but high school groups and the Youth Conservation Corps are in the park during the summer. The education program operates independently of the interpretation program. Stephanie is a year-round employee, and there are generally three additional seasonal employees hired from January through April. Others help out occasionally. One is an administrative assistant, and another is a former environmental education person. Volunteer staff members have not been recruited, mainly due to housing constraints.

Volunteers from the Death Valley Natural History Association also support the education program, when they are available.

Rocks Program: The program lasts for three days and two nights and is offered to California 5th grade students in spring and Nevada 7th grade students in the fall. There are 12 to 14 of these programs throughout the year. The number of students varies from 24 to 60. Sometimes multiple classes (usually no more than two) visit at same time, with 40-50 students on average.

Deep Springs College: Park staff has been interested in working with Deep Springs College because they operate as land managers as part of the curriculum.

School visits: Associated with camp program, park staff visit schools in Los Angeles or Las Vegas. There is the potential for kids to do monitoring on plants near where they go to school as well as what they do in school. They could do phenology in DEVA that would extend from experience in classroom. The park is interested in conducting single-day phenology programs at area schools.

One day visit: These are mostly scouts groups and other organizations (see DEVA website and related download for list of these programs)

Climate change education opportunities: The park mainly focuses on geology and ecology, but at a certain level climate change is included. They speak on geologic time scales with regard to climate in the past. For example, Death Valley used to have a lake, and park staff explain its disappearance in relation to historical climate change. They don't, however, dive deeply into ongoing climate change.

With ecology lesson focused on pupfish (part of the Death Valley ROCKS camp program), park staff talk about species being adapted to extreme environments and how rapid climate change might alter the ability of species to persist.

They are piloting "***Climate Change in the WILD West***" (WILD = Water, Invasive Species, Landscape Ecology, and Energy Development). These are the four lenses relevant in the west through which one can look at climate change. The programs include both classroom and field time. Phenology could definitely fit in here.

DEVA is currently working year round with two schools as pilots:

- a) a small rural high school close to DEVA
- b) a large well-funded public high school in urban Las Vegas where students are recruited for a long term project that addresses one of four topics. They also provide content for classrooms and take students on walks in DEVA.

At the small rural school 15 students will be involved. At the large school, 24 students will be involved (the school already focuses on project-based learning, as it is a vocational school). They encourage kids to consider science careers relevant to climate change and give them marketable skills in GIS, GPS, and remote sensing. In the process, they help them cultivate stewardship for public land.

DEVA targeted these schools because they have the most flexibility. Many schools cannot hand over science class on a regular basis.

Volunteer Programs:

Stephanie is interested in working with volunteers, but this is not part of current paradigm.

Most volunteers are retired people who come for the winter programs. Jane did not know of any people who are working on plants.

DEVA does have an *SCA program*. They mainly do tamarisk surveys and treatments. Intern program costs as much as hiring a government employee. A six- month SCA costs \$14,000.

Jane also suggested that they might be able to offer the maintenance staff opportunities to participate in phenological monitoring, especially because they visit the same locations each day.

Existing Park Records:

Jane has considered keeping track of course level data on bloom times. Parks like DEVA and Joshua Tree have monitored timing of wild flower blooms for decades, typically on a weekly or monthly basis for purposes of sharing this information with park visitors. Reporting, however, can be sporadic. There is data out there and it would be interesting to compile and see if plants bloom reliably at certain time of year. The record keeper at DEVA is Alan Van Valkenburg.

Other Contacts:

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Interpretive Ranger

Death Valley National Park

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Devils Postpile National Monument (DEPO)

Individuals Interviewed:

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Maureen Finnerty (3.10.2011)
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Best Opportunities for Phenology:

The volunteer and interpretive programs in the park, as well as ongoing community programs, are all available for inclusion of phenological education. The park has a good relationship with the Bishop community; the main interaction with the Bishop community is through the Bishop Paiute First Bloom Program (described below). Also, the park is in the process of creating a climate change tool kit for its interpretive staff, which could include phenology. There is some potential to develop a partnership with the local California Native Plant Society as they have an active chapter in the area and have expressed interest in phenology. So far, the local CNPS has mainly been focused on invasive plant removal.

General Notes:

The park is generally open June-October, although last year they did not open until June 24. They have 4-6 paid staff members. Visitors to the park are primarily family groups who come to the park for day visits. There are 21 campsites in park.

Most of park visitors are from California, but not primarily from the local communities of Bishop (~7,000 residents), Mammoth Lakes (~7,000 residents), or Lee Vining (400 residents). Ski executives at Mammoth seem especially concerned about climate change. UCSB does presentations locally (due to the proximity of two UC Natural Reserves: the Sierra Nevada Aquatic Research Lab [SNARL] and the Valentine Reserve). A great deal of scientific research takes place in the area, and DEPO occasionally hosts academic symposiums.

The park staff is very excited about incorporating phenology but because this is a small park with very limited staff, they do not feel capable of managing a long term monitoring or citizen science

program. The number of park staff has become smaller each year, as a result existing staff is concerned about taking on a significant monitoring program without dedicated staff. The CPP could help DEPO identify a few individual plants in close proximity to headquarters or the visitor center that may be targets for monitoring using Nature's Notebook.

A Note on Plant Selection:

Plants in the local community are different from plants at the monument. If the park can get a plant list together they could collaborate with Manzanar NHS. They do not have anyone on park staff who has sufficient botanical knowledge to select plants for phenological monitoring.

Interpretive Programs:

There is lots of room to incorporate phenology in interpretive programs.

The park offers *Junior Ranger* and *Campfire Programs*. *Evening programs* draw from all of the campsites in the park. Park staff present short lectures on different topics, selected by park staff, Friday and Saturday nights. During peak season in July and August, these programs receive 30-40 people per night. Last year an intern did an evening program on climate change in the Sierras that was very well-received. The park is also developing a climate change interpretation tool kit that started last summer. This is still evolving. They could incorporate phenological concepts and practices in this tool kit and introduce phenology into ranger talks and other interpretation programs.

Education Programs:

The park website offers descriptions "for teachers" of programs and activities appropriate for different age groups: <http://www.nps.gov/depo/forteachers/index.htm>.

Outreach to schools is difficult because they tend to close the Monument in mid-October and they do not open until mid-June. This time frame does not usually overlap with the availability of classes to visit on field trips.

The park is involved with a program called *First Bloom*, which entails working with youth groups and native plants (<http://firstbloom.nationalparks.org/> and <http://firstbloom.nationalparks.org/31club.php?clubID=30>). The program is also working with youth from the Paiute tribe near Bishop. It is sponsored by the National Park Foundation, and also receives tribal and volunteer support. They are some transportation problems with First Bloom kids. Many are from the local reservation, and these children generally visit the park one time per summer.

A *phenology garden* located in the community could be easily integrated.

Opportunities with local colleges:

Deep Springs College is located on the other side of the White Mountains, just east of Bishop, CA. The Forest Service tends to work more closely with them. Dr. Amity Wilczek, who just started as an Assistant Professor at Deep Springs in fall 2010, is a plant evolutionary ecologist and plant population biologist who has a deep interest in phenological and life history adaptations. She might make a great match for the California Phenology Project.

Cerro Coso Community College (<http://www.cc.cc.ca.us/>) has five campuses in the eastern Sierra) and is another likely connection, but the park has not yet worked with them extensively.

Other education opportunities include resource-based stewardship projects with Girl Scouts, including stream bank and trail restoration to mitigate erosion.

The park has *YCC (Youth Conservation Corps)* and *CCC (California Conservation Corps)* crews that they try to provide with education and stewardship opportunities in the parks. For more information, see the websites below:

<http://www.nps.gov/gettinginvolved/youthprograms/ycc.htm>
<http://www.ccc.ca.gov/Pages/default.aspx>

Volunteer Programs:

Volunteer numbers vary and include youth groups and work groups (e.g., Girls Scouts, First Bloom stewardship project). Including YCC, the park has about 100 volunteers a year who contribute about 2,000 hours. The park also has 2-3 SCA interns each year.

There is room for more volunteer programs, especially programs that go beyond picking up trash and ripping up plants. They feel that phenology is a great volunteer opportunity because it “gets volunteers to do science.”

Technology In the Park:

They have a twitter feed, a facebook site, and a website (<http://www.nps.gov/depo/index.htm>).

Other possibilities for engagement with the public:

Bird banding demonstrations in the fall are well attended in August and September. On some occasions they have hosted up to 80 people. They have also had some success in working with school groups who assist with banding birds, but there is no consistent funding for this project. (They lost it this year, but hope to reinstate this program with funding next year).

Phenology Requests:

I-phone applications are something they would be interested in, especially if the material is provided for them.

DEPO would like to be provided with a phenology tool kit. Training would be outstanding too, especially the training opportunity was brought to the park. DEPO also expressed interest in having a manual for how to establish a phenology garden.

If phenology requires ongoing participation at this park, there is currently insufficient staff, although the training of volunteers could mitigate this problem. If they create phenological monitoring locations near their visitor centers, they would appreciate guidance to make sure data collection is accurate and results are something they can use. This could be something they can download from the Internet.

Golden Gate National Recreation Area (GGNRA)

Muir Woods National Monument

Presidio of San Francisco

Individuals Interviewed:

Sue Fritzke (3.9.2011)
Branch Chief, Vegetation and Stewardship
Golden Gate National Recreation Area
Phone: 415-289-1837
sue_fritzke@nps.gov

Will Elder (3.9.2011)
Park Ranger in Interpretation
Golden Gate National Recreation Area
Phone: 415-561-2826
will_elder@nps.gov

*** This report also includes notes from the 3.9.2011 Earth to Sky Webinar

Best Opportunities For Phenology:

There is lots of flexibility within the natural-resource based programs to incorporate new themes like phenological monitoring, This should likely be the focus of CPP activities in the first year.

General Notes:

Will has tried running interpretive programs directed at climate change concepts and has not found an audience at the park. He thinks it is more useful to incorporate climate change and phenology into existing programs than to run specific programs on climate change.

Interpretive Programs:

Ranger-led walks at Muir Woods (MUWO): Short walks are available on a daily basis and longer scheduled walks focused on some aspect of the natural world are scheduled approximately once a month. The park likes to incorporate climate change programming on these walks

Into the Redwood Forest at MUWO: This is a school group program directed at 3-5th graders. See: http://www.nps.gov/goga/forteachers/elementary_01.htm

Geologically-oriented programming at Marin Headlands visitor center: The park wants to incorporate climate change programming, focused on future sea-level rise.

The Crissy Field Center (<http://www.parksconservancy.org/our-work/crissy/>) is an environmental education center, run by Golden Gate NP conservancy. A 25Mb document called “Finding Urban Nature” is available at:

<http://www.parksconservancy.org/our-work/crissy/programs/finding-urban-nature.html>

Education Programs:

The park website offers descriptions “for teachers” of programs and activities appropriate for different age groups: <http://www.nps.gov/goga/forteachers/index.htm>

There are two important partners that GGNRA works with in much of the education programming at the park:

Presidio Trust (<http://www.presidio.gov/>); this is a federal agency that co-manages natural resources on the Presidio and hold many weekly programs; they are very interested in getting involved with CPP activities.

Golden Gate National Parks Conservancy (<http://www.parksconservancy.org/>); this organization runs many different activities in the park, both volunteer-based and curriculum-based, including a park stewardship program and a native plant nursery program (which generates most of the plant propagules for restoration projects) and almost daily programs at the nursery.

Technology in the Park:

(These notes are from the 3.9.2011 Earth to Sky Webinar)

Park Contact: Will Elder

There are two episodes being developed for GGNRA. The series has an NPR radio show format. Will Elder interviews scientists, people involved with sustainability, NPS Inventory and Monitoring staff members, and famous people like Daryl Hannah. Will selects interviewees based on their relevance to GGNRA and other west coast parks. Part of the process has been to create questions that help to introduce the work of scientists and questions that highlight specific ecological or resource management issues in the parks. These interviews also aim to address how members of the public can get involved with an issue in the park.

The biggest barrier to producing podcasts: Most people said they do not have enough time; others mentioned their lack of technological expertise

Will uses Audacity, an open source program that can be downloaded for free and has versions for both Mac OSX and PCs. The park is not currently creating **video** podcasts, because there are accessibility issues. He estimates that it takes an eight-hour day to produce a single podcast. To

facilitate this process, he has recruited technologically informed interns and volunteers. For instructional tutorials on how to create your own podcast, see the Audacity websites at:

<http://audacity.sourceforge.net/>
<http://www.how-to-podcast-tutorial.com/17-audacity-tutorial.htm>
http://wiki.audacityteam.org/index.php?title=Creating_a_simple_voice_and_music_Podcast_with_Audacity

Best practices are listed on the website <http://earthsky.org/>

See Earth to Sky resources for more information.

Other Contacts:

Jenny McIlvaine

Volunteer Coordinator for Presidio Trust
volunteer@presidiotrust.gov

Betty Young

Director of Nurseries for Golden Gate National Parks Conservancy nursery
--she also identifies "top flower-viewing hotspots" in the park
byoung@parksconservancy.org

Sue Gardner

Director of Park Stewardship Staff for Golden Gate National Parks Conservancy
Phone: 415-561-3067
sgardner@parksconservancy.org

Christy Rocca

Director of Crissy Field Center for Golden Gate NP Conservancy
Phone: 415-561-7750

Mia Monroe

Site Supervisor
Muir Woods National Monument
Mill Valley, CA
--very interested in climate change and phenology
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Other Golden Gate National Parks Conservancy staff:

Monica Stafford, Program Manager: 510-295-7727; mstafford@parksconservancy.org

Jennifer Brink, Office Operations Manager: 415-561-3076; jbrink@parksconservancy.org

Meghan O'Connor, Oceana Nursery Manager: 415-517-6373; occonnor@parksconservancy.org

Eddie Araujo, Youth Program Coordinator: 415-756-9448; earaujo@parksconservancy.org

Christina Crooker, Restoration Manager: 415-561-3070; ccrooker@parksconservancy.org

John Muir Historical Site (JOMU)

Individuals Interviewed:

Morgan M. Smith (3.14.2011)
Chief of Interpretation, Education and Outreach
Eugene O'Neill National Historic Site
John Muir National Historic Site
Rosie the Riveter/WWII Home Front National Historical Park
Port Chicago Naval Magazine National Memorial
Phone: 925-683-9958
morgan_smith@nps.gov

Fernando Villalba (4.7.2011)
Biologist
Eugene O'Neill NHS, John Muir National Historic Site
Rosie the Riveter/WWII Home Front National Historical Park
Port Chicago Naval Magazine National Memorial
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fernando_villalba@nps.gov

Matt Holmes (4.7. 2011)
Education Technician
Rosie the Riveter WWII Home Front National Historical Park
John Muir National Historic Site
Eugene O'Neill National Historic Site
Port Chicago National Historic Site
Phone: 510-232-1542, ext 6623
Fax: 510-232-5504

John Muir Historic Site phone number: 925-228-8860

Best Opportunities for Phenology:

The best opportunities for phenology are currently in the education programs. The park is very enthusiastic about developing a long term monitoring program in the community and they already have contacts with a number of interested and talented long-term educators in the community.

General Notes on the Park:

The Site is now open seven days a week and has eliminated the entrance fee. Most of the visitation is from the East San Francisco Bay Area. School groups make up about a third of the total park visitation. The park does not receive too many "hard core" Muir historians.

There are Five interpretive staff members on sight including :

- a lead ranger
- two interpretive guides
- an interpretive supervisor

Fernando is the natural resource person for all four East Bay parks. He will be spending 20 percent of his time developing youth engagement programs and partnerships, and working with schools.

All of the people interviewed at this park seemed to agree that there is lots of potential to incorporate new programs right now. There is an overall sense that this is an ideal time to incorporate phenology at the JOMU, as they are trying to expand their natural resources and history programs. Park rangers do a good job interpreting the history of the Victorian house that Muir lived in and his experience running the family orchards. Much of Muir's activism was fueled by his time living in Martinez. The park would like to continue to develop interpretive materials describing John Muir as a natural historian and his legacy and importance as a leader in the conservation of California's biological diversity. There are many layers of John Muir's legacy that are missing from the educational and interpretive materials at the site. Park managers are very interested in expanding Muir's legacy as a naturalist with a keen eye for observation and relating this theme to current environmental challenges, including climate change.

Environmental historian Donald Worster visited the site three years ago and provided feedback on what themes the park could develop and how to approach various partners in the community. Though some of the conservation issues today are different than those encountered by Muir, there is a sense that his legacy can provide important guidance for tackling today's issues, and that his methods of observing the natural world are still applicable. See the Worster Report (*need citation for this).

The park is currently working towards implementing an historical ecology study to help understand how the landscape at the site looked like when Muir was alive.

The historical site is divided into three sections, and is bisected by a highway:

- 1) On the north side of Hwy 24 lies the Muir House, orchard, and adobe structure where the park offers historical tours
- 2) On the south side of the highway lies Mount Wanda where the park offers offer nature walks and night programs, and the Muir-Strentzel gravesite.

Interpretive Programs:

Native Garden: In front of the visitor center there is a small demonstration native garden that is representative of local native plant of the area.. The park offers an annual tour with a local garden group. A full-time horticulturalist, Keith Park, takes care of the garden with the help from a core group of volunteers who come weekly to work on the native gardens. Many of the species

that Muir planted, such as giant redwoods, are exotic to the Easy Bay Area and many of the plants in native garden would have pre-dated Muir.

Ranger tours: The park offers bird walks and flower walks on Mount Wanda, a 300-acre natural area that connects with East Bay Regional Parks. They do 30-40 minute hikes to the summit. There is a nature trail that branches off of the fire road. They also do some butterfly monitoring but mostly among the staff, not the general public. Keith Park works with botanists from PORE to do invasive species monitoring there too.

Self-guided tours: On Mount Wanda there is a self-guided program with pictures and descriptions of different species. It is possible that this program could be revised to incorporate phenology.

The park hosts a big festival for **Earth Day and John Muir's birthday** each year with 50 exhibitors. This year, the festival took place on Saturday April 16th, and Margot Higgins hosted a phenology table.

The park also offers a one-day, hands-on **environmental living program** during which kids wear clothing from John Muir's time. The children make adobe bricks, dip candles, and construct bird houses by hand. In the future, park staff would like this event to emphasize observational skills (potentially including phenology) that recall John Muir's experience.

The park would like to improve connections with East Bay Regional Parks; both groups would like to have a more meaningful collaboration.

Education Programs:

The park website offers descriptions "for teachers" of programs and activities appropriate for different age groups: <http://www.nps.gov/jomu/forteachers/index.htm>

The park currently works with a number of Bay area school groups and they receive a few thousand student visits a year. The high visitation season for school groups is generally October, November, February and March. One or two student groups visit the park on a daily basis. But this mainly involves the presentation of a movie and a house tour. The park is interested in incorporating more natural history into these programs. Most school visits are currently one-time visits, but the park is interested in attracting classes that would participate in a monitoring program throughout the year.

In the Summer of 2011 Park Staff conducted a Teacher Workshop to take the pulse of local educators who make up over a third of park visitorship in order to determine best practices for supporting classroom objectives. Key Objectives were to identify barriers to on-site attendance, the lack of repeat visitors in a single year, the absence of Muir based programming off-site in classrooms.

This Workshop resulted in the identification of three primary themes; **John Muir's Life and Legacy** (Historical), **John Muir the Scientist**, and **John Muir the Activist**, new *relationship-*

based outreach approaches for inviting new teacher attendees, and the inclusion of off-site programming to bolster the on-site educational offerings. Each of our education themes are currently being populated with educational programming to address each theme with a formula that loosely consists of a pre-site visit that prepares visitors with foundational information, a more focused on site experience that only incorporates those features of the site that are germane to the thematic lesson, and finally an appropriate evaluation in the hopes of developing programming that offers an increasingly deeper connection between classroom visitors. Each lesson will contain at least one kinesthetic element and at least one passage from Muir's own writing. The diversity of programming will allow teachers to re-visit our site in ways that were previously unavailable. The availability of these offerings will be advertised through a corps of teacher liaisons, start-of-the-year teacher luncheons to be hosted on site and increased cooperation between the park education staff and school district information offices

The California Phenology Project neatly addresses the "John Muir the Scientist" theme. It naturally contains the kinesthetic elements of outdoor exploration and observation required by our education plan and could easily be equipped with the appropriate historical context to incorporate Muir's work with the work performed by Phenology Project participants.

JOMU has recently signed a Memorandum of Understanding with the Martinez Unified School District and *New Leaf Collaborative*, a grass-roots collaborative that is centrally organized through two alternative high school programs – Environmental Studies Academy and GreenHouse Academy – where the curricula are environmentally-focused and where staff are interested in creating a program that would entail multiple visits and long-term service-learning projects. The intention of this agreement is to enhance collaboration between JOMU and local schools in providing students with greater experiential learning and work skills development opportunities. The Site's Youth Engagement Committee meets with New Leaf regularly, and together the group has developed an annual work plan that includes establishing a phenology monitoring program as one of the key collaborative projects. (It would be great to connect this with Death Valley WILD west project)

Last year, JOMU offered *teacher-ranger programs*, in which parks hire teachers to be rangers for the summer, and they develop materials for the school they work with.

The park plans to bring in local teachers to see how their education programs can fulfill curriculum standards. They may need to develop different programs for different seasons, but monitoring a particular species could last throughout the year.

The park is working on an activity pack that would include activities at the park along with complementary activities to be done at home. This kit would include binoculars, tools for observation, field journal etc.

Other possibilities for local school collaboration:

- Martinez High School
- Alhambra High School

-Would like to expand to a local middle school

Other Contacts:

Keith Park

Horticulturist; Garden Manager

keith_park@nps.gov

Joshua Tree National Park (JOTR)

Individuals Interviewed:

Josh Hoines (2.28.2011)
Vegetation Branch Chief
Resource Management Division
Joshua Tree National Park
Phone: 760-367-5564
josh_hoines@nps.gov

*** Missing from the call was Joe Zarki who oversees interpretation and education at JOTR, as well as the graphic-visual folks (signs and kiosks) and website development.

Best Opportunities For Phenology:

The best opportunities seem to be within the interpretive and education programs. It might be possible to incorporate phenological monitoring into the park education programs. The education staff is especially interested in increasing the scientific rigor of a program to measure Joshua Tree growth rates.

General Notes on the Park:

There are three visitor centers in the park:

Blackrock Visitor Center: This is a viable location for CPP monitoring; it includes an elevation gradient with Joshua trees, the Mojave yucca, Blackbrush, brome, and maybe other candidate taxa.

Oasis of Mara- 29 Palms Visitor Center: This is the site of a former palm oasis, but it is not transitioning successfully to a mesquite/salt brush habitat due to the dropping water table; some areas are artificially watered, but *Prosopis* would be a good choice for monitoring here.

Cottonwood Visitor Center: This VC is more remote, located near the southern entrance of the park.

Interpretation staff normally works at a single center; there is a set of staff dedicated to each visitor center, although some people “roam” seasonally.

Interpretive Programs:

Spring wildflower walks: In these programs, a JOTR staff member might take visitors out and discuss the requirements for plant growth (water, light, temperature requirements, etc). Some of these are scheduled and some are not. *It might be possible to ask interpreters to dedicate two*

walks a week to phenological monitoring; the CPP could design flyers to support this work, emphasizing that it is not necessary to record observations on each and every walk.

Junior ranger programs: Visitors show up at the visitor center and take an oath; a “naturalist at large” runs these programs. Contacts: Lorna Lange and Dave Carney

Education Programs:

The park website offers descriptions “for teachers” of programs and activities appropriate for different age groups: <http://www.nps.gov/jotr/forteachers/index.htm>. Here they can plan a field trip or download curriculum material

School groups (organized by Lorna Lange): Many of the school group visits involve repeat visits, with students taking repeated measurements of some natural phenomenon at the park. In Yucca valley, Joshua trees grow throughout the city; Joshua trees at elementary or high schools might be good candidates for monitoring

According to Lorna Lange (Education Specialist), the most appropriate ongoing program for the integration of phenological concepts and activities is the “**Discovering the Ancients**” park-based program (with classroom preparatory activities before and afterwards). This program is among the top 20 education programs in the U.S. and serves 20,000 annually, preschool through 12th grade students per year. The “**Discovering the Ancients**” program serves only high school program, with 8-12 programs requested a year. When classrooms visit JOTR for this program, the school groups are accompanied by Lorna and 2-3 staff at the field sites, where plants are measured for a variety of growth- and size-related traits (see accompanying data sheets). Each group visits one of six sites where they measure plants along pre-established transects, including: Sheep’s Pass; Keys View Overlook; Coachella/Colorado (this is being discontinued); High View at stake 22; Indian Cove; and Barker Dam. There is a well-developed curriculum that begins with classroom visits and activities prior to the park visit.

University Interns: Lorna Lange often supervises 1-2 college interns each year who work with her from January – March; she advertises these positions at a variety of colleges and universities, and the students are great.

California Regional Environmental Education Community (CREEC): a great source of environmental education resources. Their website lists ~26 educational programs offered by JOTR, many of which are offered to visiting school groups.

http://creec.edgateway.net/cs/creec8p/view/creec_org/632

Teacher Workshops. The park also offers teacher workshops and this would be a good way for schools to interact with phenological concepts and activities.

Volunteer Programs:

Seasonal SCA interns might be able to participate in CPP surveys on a regular basis.

Other possibilities for engagement with the public:

CNPS involvement at JOTR: They currently conduct rare plant hunts (revisit locations of old vouchers to see if they can find rare species). There is some population monitoring at permanent plots. Kate Barrows (kate.cnb@verizon.net) is the president of the Riverside/San Bernadino Chapter of the CNPS (<http://www.enceliacnps.org/index.php>).

Possible resources for legacy data:

Herbarium in the resources building at Twentynine Palms: Specimens date back to 1940's; these were in the JOTR Museum when James Cole was the botanist and superintendent. Tasha LaDoux started the herbarium at JOTR National Park; the herbarium now houses 1988 sheets (plus 800 unprocessed sheets), covering ~820 taxa.

Miriam Vamstad told us of a 20-30 year **seed collection** activities targeting >100 species, where the dates of collection and locations are indicated.

Other Contacts:

Dave Carney, Supervisor of Interpretive Operations: dave_carney@nps.gov

Dr. Vicky Chang, Science Coordinator: victoria_chang@nps.gov
--coordinates citizen science programs for the park (plant inventory, invasive species inventory along roads, etc.); designs data sheets for citizen scientists; recruits visiting scientists to confirm IDs; facilitates permitting for graduate student research

Andrea Compton, Chief of Resources: andrea_compton@nps.gov

Caroline Conway, Outdoor Education Coordinator for Wildlands Conservancy
(www.wildlands.org): caroline.c@twc-ca.org

Caryn Davidson, Education Park Ranger (works with Lorna Lange): caryn_davidson@nps.gov

Dave Denslow, Interpretation Park Ranger (Joshua Tree Visitor Center):
david_denslow@nps.gov

Lesley Gaunt, Interpretation Park Ranger (Cottonwood VC): lesley_gaunt@nps.gov

Rob Hannawacker, Park Ranger interested in entomology and climate change

Tasha LaDoux

-- works for Josh part-time; great botanist and very knowledgeable about Mojave flora

Lorna Lange, Education Specialist: lorna_lange@nps.gov; 760-365-2371

--based at Black Rock; the UCSB team met with her in March 2011 and discussed currently active educational programs that engage classes and their teachers.

Miriam Lara-Vamstad, Restoration Ecologist: miriam_vamstad@nps.gov

Julia Lynam, Seasonal Interpretive Ranger: julia_lynam@nps.gov
--puts together the wildflower lists

Pat Pilcher, Interpretive Ranger (Oasis VC): patrick_pilcher@nps.gov

Michael Vamstad, Wildlife Ecologist: michael_vamstad@nps.gov

Karina White, Desert Institute (desertinstitute@zippnet.net; 760-367-5535)

Joe Zarki, Chief of Interpretation: joe_zarki@nps.gov
--experience with backyard bird counts and butterfly citizen science programs

Lake Mead National Recreation Area (LAKE)

Individuals Interviewed:

Alice C. Newton.
Vegetation Management Specialist
Lake Mead National Recreation Area
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Boulder City, Nevada 89005
Phone: 702-293-8977
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alice_corrine_newton@nps.gov

Best Opportunities for Phenology:

The park has well-developed volunteer programs and good connections in the surrounding communities where there are many retirees. Phenology fits with the park's overall outreach goal of better educating and incorporating volunteers from the surrounding communities.

General Notes on the Park:

Like most parks in the desert, LAKE encompasses a huge geographic area (including the lake itself).

There is just one visitor's center in the park near Boulder City, and there are some established trails near it. It is currently under renovation.

Park visitation is highest for the lake in the spring through the fall, although backcountry visits are higher from fall through spring. The lake is crowded during the summer, but the back-country is generally too hot for high visitation.

The neighboring communities are Boulder City, Nevada (population ~15,000) and Las Vegas (pop. ~ 2,000,000). Phenology could help the park make the Las Vegas community aware that LAKE includes a much wider range of habitats and biological diversity than that seen at the lake alone. Many of the park's outlying communities (particularly in north), were settled in the late 1800s. There is a history of what is now an inappropriate use of back country areas, especially the use of Off Road Vehicles. Educating residents about the ecological risks associated with ORV use is a major park goal. All program managers have been charged with developing volunteer opportunities to reach out to these groups. The hope is that this will help the park reduce and repair ORV damage.

There are lots of enthusiastic back-country users at LAKE, but many use ORVs. Phenological education (and its link to climate change) could help to encourage responsible back-country use. The park staff wants to help the community understand its natural resources and why the park

prohibits ORV use. Their ultimate goals are: to establish better relations with the surrounding communities, to inspire local stewardship for the park, and to promote understanding of why the NPS makes certain rules and decisions.

The park does not consider education to be the job of the Interpretation division alone (Resource Management staff are included in these efforts). The volunteer program is more integrated with Interpretation at LAKE (relative to some other parks) because they make it a point to work closely with one another.

Interpretive Programs:

The park offers several *ranger-guided hikes* at Lake Mead and Lake Mohave (<http://www.nps.gov/lake/planyourvisit/guidedtours.htm>).

LAKE has a *Junior Ranger* guide and activity book for kids. It covers concepts such as Leave No Trace, Invasive Species, Adaptations, and Water Resources.

There is a plant identification activity (“Keyed Into Plants”) oriented towards fourth-graders, which rangers bring to classrooms (<http://www.nps.gov/lake/forteachers/loader.cfm?csModule=security/getfile&PageID=128257>).

Volunteer Programs:

The park has numerous volunteers in different capacities, including SCAs, seasonal volunteers and local citizens.

Near LAKE there is a large community of professionals, and the volunteers include retired professors and biologists who are familiar with technology and who could work well with interpretive staff and volunteer management.

LAKE volunteers are not managed by the interpretation staff at the park, but interpretation can help to recruit volunteers. The actual implementation of volunteer-based phenological monitoring would be co-managed by staff representing volunteer management and vegetation management.

Other volunteers include retired “snow birds” that visit the park in the winter. The park provides them with trailer hook up space. If they work for the park 12-24 hours a week, they can stay in the space. Volunteers do a great deal of field work for the park. The limitation is that they are only there November through April. But this could provide for adequate phenological monitoring of certain plants.

There are also locals that do things for the park on a regular basis.

The *Volunteer Stewardship Program* could also incorporate phenological monitoring into their activities. The park has a number of roads and trails in the park that they treat as trail system because they are very primitive. Small groups of participants could adopt a trail and commit to a

specific time frame for phenological monitoring of targeted plants. See:
<http://www.nps.gov/lake/parnews/hikers-needed-for-lake-mead-trail-tracker-program.htm>

All volunteer training on phenology would take place in Boulder City, Laughlin, or Overton, NV or Meadview, AZ.

Locations for Trails:

Because the park is so spread out, Alice Newton is interested in trying to capture a north/south gradient along the Colorado River corridor, where the elevation and soil type remains relatively constant. They are interested in creating a trail system extending north, south and east in the park, including locations amenable to multiple visits. Comparative phenological sampling across the latitudinal gradient would require standardizing for soil, slope, and aspect, which will likely affect phenological patterns. There are also opportunities for similar comparisons to be made in Overton Bay or Echo Bay in the North part of the NRA and in Cottonwood Cove and Katherine Landing, near Bullhead City, Arizona and Laughlin, Nevada in the South part of the park.

The eastern part of park (near Meadview, AZ) is much more remote, and covers a different ecotone from the western locations in the park. But it is very possible that the park could find a volunteer base there as well.

Lassen Volcanic National Park (LAVO)

Individuals Interviewed:

Janet Coles
Plant Ecologist
Phone: 530-595-6187
janet_coles@nps.gov

Steve Zachary
Education Specialist
Phone: 530-595-6132
steve_zachary@nps.gov

Best Opportunities for Phenology:

The best opportunities at this park seem to be within the existing education programs. A trail near the Discovery Center/Loomis Museum would be a good spot for CPP monitoring sites.

General Notes:

LAVO has the smallest park staff of the six CPP pilot parks and most staff is only seasonal; nevertheless, the education program is well-developed. Thirty-two county school districts participate in park visits, including over 140 individual schools, ranging from kindergarten to graduate school. Much of the interpretive programming at LAVO is concentrated in the summer and focuses on the volcanic nature of the park, with a complementary emphasis on habitats and communities. The bulk of the programming is on the north side of park because that is where the largest campground is located.

Interpretive Programs :

Discovery Center at Loomis Museum (near Manzanita Lake): This facility houses exhibits and hands-on materials (e.g., conifer cones) covering biological and other sciences. It's open from Memorial Day to Labor Day. The Lily Pond trail is nearby, which provides a self-guided tour brochure covering 32 designated locations; it's an easy and accessible trail heavily used by school groups. There is another self-guided trail ~9 miles further into the park (Devastated Area Interpretive Trail), where a variety of successional stages of plant communities are easily accessible because of the Lassen Peak eruption. The lava flows are well documented in photos.

Walks, talks, evening talks, living history program: These programs are generally offered in the summertime (most run June 18th through Labor Day) by a small staff of six seasonal interpretive staff members with some help from high school interns. Some of the programs are scheduled (announced in the park newspaper and on bulletin boards at visitor centers); others are extemporaneous. The programs begin at both Kohm Yah-mah-nee Visitor Center (in the South)

and at the Loomis Museum (in the North), although most programs are at the North end of the park.

Native American program: This program was originally led by Native American elders, but there no young people around to maintain the program, so it is no longer running. This program included Native American lore and uses of plants; LAVO educational materials contain this information

Junior ranger program: <http://www.nps.gov/lavo/forkids/beajuniorranger.htm>

Green Junior ranger program: similar to traditional Junior Ranger program, but more focused on sustainability

Volcano club program: <http://www.nps.gov/lavo/forkids/volcano-club-card.htm>

Sense of Wonder: a nature-awareness program directed at pre-school aged children and parents

Kohm Yah-mah-nee Visitor Center: open year round at the southern end of the park
-climate action plan: project currently underway to create an interactive exhibit/demo directed towards younger visitors

Education Programs:

The park website offers descriptions “for teachers” of programs and activities appropriate for different age groups: <http://www.nps.gov/lavo/forteachers/index.htm>

The education program is quite large. There are 32 county schools that visit the park, with over 140 individual schools, ranging from kindergarten to graduate school.

School visits: Both public and private schools visit the park, although public schools tend to visit for a single day trip, while the private schools stay longer (2-3 days at a time). These trips primarily occur in late summer or fall (September and October are really busy). LAVO has pre- and post-visit materials that are provided to the teachers, primarily covering Earth Sciences concepts. LAVO also offers ranger-led programs for school groups depending upon curricular needs. The bulk of school visits are by 3rd – 8th grade students, although there are also college student visits primarily from Biology, Earth Sciences, Winter-ecology, and Botany classes.

Summer high school intern program: This is a great candidate program for integrating phenological monitoring at LAVO. In this program, ten high school junior and seniors spend the summer camping at Lake Manzanita campground (North part of the park) and assist with a variety of activities, including: exotic plant removal, wildlife monitoring, interpretive programs, and development of interpretive aids (i.e., conifer cone collections, games/activity development, etc.). Allocating two days per week for phenological monitoring would be a strong possibility. 2011 is the 16th summer running this program; it is partially funded by the Lassen Park foundation. One limitation to bear in mind is that these students do not have access to NPS

computers because they do not complete a background check, so they cannot upload phenological data at the park.

Astrobiology interns: This year-round program is funded by NASA and targets kids at local schools (e.g., Red Bluff High School), who collect scientific data for NASA astrobiologists and the National Park Service. They use study plots in the hydrothermal areas of the park, looking at microbial life forms, extremophiles, and more. This is part of the Mission to Mars program.

Opportunities for engagement with local LAVO community:

There are two nearby ***CNPS chapters***, one based in Redding and one in Chico; members visit the park on multiple, semi-regular field trips

There are several ***local colleges*** whose botany and ecology professors run field trips to the park (e.g. Shasta College).

The members of the ***Gateway Science Museum*** in Chico are also attracted to the park (<http://www.csuchico.edu/gateway/>).

Visitors to the ***Turtle Bay Exploratorium*** in Redding (www.turtlebay.org) are also candidates for inclusion in phenological monitoring at the park.

→all of these groups might be interested in joining CPP trainings at LAVO!

Note: a new interpretation plan for LAVO is currently under development and should be available when completed in a few months.

Lava Beds National Monument (LBE)

Individuals Interviewed:

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Jason Mateljak (3.6.2011)
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Best Opportunities For Phenology:

The best opportunities for phenology at LBE include training the YCC Crew and integrating phenology with evening ranger talks and education programs.

General Notes on the Park:

Sixty percent of park visitation is local or regional. The surrounding community is an agriculture-based community, and many of the locals are concerned with water resource issues. Park managers report that efforts to educate the public about climate change and its ecological risks have been met with resistance, the mitigation of which is assumed to infringe upon individual rights.

Park interpretation activities and education focus on The Modoc War and people, but they are beginning to take on concepts such as climate change and the night sky. An emphasis on ice and the ice environment has been the park administration's main way of engaging the public in ongoing ecological changes, but they have not been very focused on species impacts.

The park consists of many different ecosystem types at a variety of elevations; the visitor center is at 4900' elev.

The park has a GS4 term year round and a GS5 supervisor. This is the entire permanent staff. Summer positions include up to three seasonals or SCAs, but these students can require a great deal of training time. The maximum staff level at any time is nine individuals.

Fall or spring would be the best time for training programs. Spring is very busy because they are training interpretive staff but phenology could fit in. There is a large county fair during the 2nd week of September so training workshops should avoid this time period.

Education Programs:

The park website offers descriptions for teachers of programs and activities appropriate for different age groups: <http://www.nps.gov/labe/forteachers/index.htm>

The park website describes the availability of self-guided and ranger-guided activities for various age levels, curriculum material, traveling trunks, and special events, such as the upcoming Timeline Living History.

Most of the curriculum material is for grades 3-6. The main season for student visitation is March-May, the first two weeks of June, October, and November.

Park visits range from two students up to four classes (or 200 kids).

Programs are usually held in a cave or on a trail (up to 30-40 kids at a time). Students generally come for a whole day, spending five to six hours on the site. Travel to the park from the local communities can be one to three hours. Some classes will camp out for three days to a week.

The park provides classroom ranger programs as well as on-site ranger programs. They also offer *traveling trunks* with lessons focused on one of five themes: geology, cultural history, bats, cave life, and birding (<http://www.nps.gov/labe/forteachers/travellingtrunks.htm>). LABE is also in the process of putting together an education resources binder.

All components of the education program at LABE meet curriculum standards for both Oregon and California and they already make use of plant and animal checklists.

Most of the education efforts are focused more on animals than on plants (there is a strong focus on Pica, which park watches closely and which currently exist in high abundance at LABE).

A regional group called the Klamath Birding Observatory is in the process of putting a bird guide together for the park. Park staff indicated that LABE has a gap in the program. LABE had lots of people 10-15 years ago who were very into plants. As people departed the park changed the emphasis to look at environmental change as impacted by fire.

School programs at LABE are generally tailored to what the teacher wants; the

demand for guided school group visits varies with the economy. Three programs are offered on site: (1) a tour of Valentine Cave, focusing on the geology, cave formation, and the wildlife in the cave, (2) a powerpoint presentation on cave-related geology, and (3) a cultural history program, focusing on the Modoc culture and including a half mile hike. See <http://www.nps.gov/labe/forteachers/rangerlededprograms.htm> for more information.

For one school group a year, the park puts on a fire ecology program, in which they go over a check list to do a prescribed burn and describe the importance of prescribed burns.

Interpretive Programs:

The park hosts an *evening campfire program* on various topics that generally lasts 1 – 1.5 hours. These are often SCA run, and they allow interns to present topics they are interested in or demonstrate a particular skill set they have. Generally those that give evening programs have interpretive training.

The park also offers two *daily cave walks*. These walks and talks are based on staff level of interest. Phenology could definitely fit in here.

Volunteer Programs:

Youth Conservation Corps (YCC) is probably one of the most promising ways to incorporate phenology at LABE. CPP could give YCC members a list of plants to look out for, and YCC members can choose to participate.

Each summer YCC hires two leaders with an eight person crew, plus one seasonal who is an official field lead. These leaders are also interns and they change every year.

The YCC work mostly involves non-native plants removal, trail maintenance, and restoration projects. Their time is split between the maintenance and resource divisions.

Natural Resource Management Activities:

Dave Larson is Chief of Resource Management in LABE.

The park conducts regular management burns that alter the local environment, and they have removed many junipers on the northern end of park. They have also removed some migratory species that are not exotic but are not species traditionally found at the northern end of the park.

Junipers suck water out of ground, altering the grass sage environment and changing plant and animal species composition. They provide raptor habitat and lead to the decline of sage grouse.

The park is also responding to white nosed bat syndrome, but they are hesitant to claim that this disease is linked to climate change because the causal relationship has not been confirmed.

Technology in the Park:

The park received funding for public wifi. They are working on a web station right now that allows videos and podcasts and will allow access to websites and wifi. It may not be running this summer, due the park's small staff, but they hope to develop it in the next few years. This will enable people to download programs for cell phones. Topics like phenology would be well suited to take advantage of this resource.

Phenology Requests:

i-phone applications
material for interpretive staff
material for evening programs

Mojave National Preserve (MOJA)

Individuals Interviewed:

Jennifer Morrell (3.19.2011)
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Mojave National Preserve
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Best opportunities for Phenology:

The best opportunities for integrating phenology into ongoing park activities are the existing interpretive and education programs designed for specific environments within the park. There are also a number of opportunities within the volunteer programs at MOJA.

General Notes on the Park:

The park is fairly spread out and covers a wide range of environments.

Interpretive Programs:

The *main visitor center at Kelso Depot* is in the heart of the preserve at ~2,100 feet in elevation. Seven miles south is Kelso Dunes where visitation is high; the park offers *Dune Walks at Kelso Dunes*, which are open to families. The park is trying to add staff to this area to offer more programming. This site caters to day visitors. There is no campground at this site and there are no evening programs. The programs that the park offers on Saturdays attract a wide range of adults. Some college groups visit and request rangers to go out with them; the park also offers programs to local elementary and high schools. There is a scheduled one-hour walk every Saturday, which does not bring people to the top of the sand dunes (650 feet high). The trip to the summit is 3 miles long and takes about 3 hours. From the top there is a good view of several plant communities, including creosote, juniper, and the boundaries of different communities.

The other visitor center, *Hole-in-the-Wall*, is at 4,000 feet in elevation with an entirely different geology; it's only open during certain portions of the year and on only a few days of the week. This is a different environment than the lower elevation sand dunes and includes barrel cactus, shrubs, and grasses. Unlike Kelso Depot, there is a campground at Hole-in-the-Wall that attracts families and retired couples with recreational vehicles. There is less educational programming here because it is not as accessible as Kelso Depot. The park staff would like to expand opportunities here, especially at Mid Hills. Fire ecology could also be brought in here due to the effects of the 2005 fires. *Plant Detectives* takes place at Hole-in-the-Wall (visitors identify vegetation). Also offered at this site are *an evening program about the Mojave Desert* ("Someplace Special") and *a geology program* ("Geology of the Mojave").

Another popular spot, with low staffing but high public use, is the *Teutonia Peak Trail* at ~4200-5000 feet, where the most dense population of Joshua trees is located. The area includes Joshua trees, small shrubs and wildflowers. When there is sufficient staff, the park offers wildflower walks in this area. These walks are typically an hour long and include the first mile or so of the 3-mile trail. Depending on what is blooming, the rangers may also discuss plant-animal interactions

Education Programs:

Currently, the educational programs are offered primarily to the general public, although the park does offer 3-4 overnight trips to *Zzyzx* for school children (primarily 5th and 6th grade, but other grades would also be welcome.) The kids stay in a dorm at this site as part of the University of California's Education Research Center. It would also be possible for the staff to lead trips for public school classes to *Hole-in-the-Wall*, but this would involve outside camping and require funding to purchase camping equipment.

The park recently partnered with the *National Park Trust* to host a school from Nevada for one day; transportation difficulties make such participation a challenge.

The park also offers *traveling trunks*, which are often focused on cultural history or endemic species. The trunks contain everything needed for a program. Park staff said that a traveling trunk specific to phenology in MOJA would be an especially useful resource.

Dora McKeever runs a **Career Training Education** program (CTE) that hosts kids for several weeks at a time. The program introduces students to possible careers with the BLM or with local businesses. They are enthusiastic about approaching phenology from a career development perspective.

Deborah Hughson, MOJA Science Advisor is involved in the *Desert Discovery Center* (DDC) run by *Discovery Trails*, which is nonprofit organization in Barstow. She works with K-12 kids who come through there for programs. The Center is a bit like a museum, with exhibits and an outdoor area; there are also conference rooms where programs can be held.

From the *Discovery Trails* website (<http://www.discoverytrails.org/index.html>): Discovery Trails is a nonprofit, 501(c)3, organization dedicated to motivating the general public, of all ages, to *responsibly* use the Mojave Desert for education and recreation. School age students are encouraged to participate and begin studies in the fields of geology, history, biology and anthropology. Environmental and recreational programs are geared to attract even the least motivated student by joining the students current interests and science together. This is done through the Desert Discovery Center, an interactive learning center, coupled with fieldtrips to locations (on and off-road) in the Mojave Desert that will enhance the experience. Learning doesn't stop after visiting the Desert Discovery Center. After school, weekend programs and field trips are scheduled regularly to reinforce what has been learned.

From the *Desert Discovery Center* website (<http://www.discoverytrails.org/welcome1.html>): The Desert Discovery Center (DDC) is comprised of a unique partnership between the Bureau of

Land Management, National Park Service, Barstow Unified School District, Barstow Community College, Mojave River Valley Museum, City of Barstow, and Discovery Trails non-profit organization. The mission of the DDC is to develop and implement a comprehensive formal and informal education center with programs focusing on the natural, cultural, and historic resources associated with the Mojave Desert.

The Center programs are not as hands-on as the programs in the reserve. The staff at the Center is mostly volunteer so the Center has limited hours and days, usually 11 to 4 pm.

Volunteer Programs:

Volunteers generally work in the visitor center, where they talk with park visitors. They also lead trail programs and clean up. In addition, they host interpretive programs in campgrounds at Hole in the Wall. Most current volunteer programs are work-related projects, though some work with Annie Kearns to pull weeds or with Neil Darby to monitor wildlife using cameras.

Technology in the Park:

There is an organization that works with MOJA park staff on GIS in the Barstow office. They work with many other federal agencies on i-pod apps, web development etc. They just developed an i-phone application for tortoises with which users may record the GIS coordinates of tortoises that are encountered and upload photographs.

Phenology Requests:

Currently MOJA doesn't have the staff to conduct long-term phenological monitoring. The park is enthusiastic about using smartphone or iphone apps for phenology and to introduce a traveling trunk with phenological activities for local/regional schoolrooms.

MOJA is very interested in having access to a general power point on phenology, its effect, why we care about phenology, and its link to climate change. Park staff receive many requests for programs from the local veterans center, businesses, schools and they said it would be great to have something to show periodically in these places and at the visitor's center. Park staff would also be able to implement short phenology lessons at Hole-in-the-Wall

Other Contacts:

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--oversees all interpretive programming for MOJA

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--oversees and conducts interpretive programming at HITW, educational outreach in the Needles area, and coordinates all volunteer operations in the Preserve; also works with the YCC every year.

Dora McKeever

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--coordinates and conducts environmental education programs to local communities

Hilary Clark

Lead Interpretive Park Ranger at the Kelso Depot Visitor Center

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--oversees and conducts interpretive programming at the Depot and surrounding resource areas such as the Kelso Dunes and Teutonia Peak

Deborah Hughson

Science Advisor

Mojave National Preserve

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Pinnacles National Monument (PINN)

Individuals Interviewed:

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Best opportunities for Phenology:

The best place to incorporate phenology is through the volunteer program in resource management because there is a full-time volunteer coordinator in that division.

General Notes on the Park:

The park has a relatively small staff and consequently individuals often have multiple responsibilities. For example, resource management staff are often involved with interpretation. The interpretation program is in transition, with lots of staff turnover and new hires. Currently, there is no Chief of Interpretation but someone will be hired within a few months. As a result, relatively few interpretive programs are being offered at this time.

The season at PINN starts in March; peak visitation is in April (it's very hot and dry in the summer). Most visitors come from the Bay Area for day visits and include fewer international visitors than do larger parks, such as Yosemite. (PINN is 1.5 hours from San Jose; the west entrance is just over an hour from Monterey.) Nearby local communities include Salinas, Hollister, and Soledad; these communities do not depend entirely on tourism or on the park. The park does quite a bit of outreach to work with local communities, and the park is generally well received. Local people are proud of the park, and the local paper is called the *Pinnacle*.

This is not a park for auto tours; visitors need to leave their cars to experience the park. There are two entrances: the west side is accessible from the Salinas Valley, while the east side (is accessible from Highway 25. There is no road connecting the two sides of the park. A new visitor contact station is being constructed on the west side of the park and will be open to the public in 2012.

Interpretive Programs:

The park offers a ***Junior Ranger Program***.

Evening programs also exist and they are mostly run by full time volunteers or paid staff.

There is lots of camping in the park (149 sites), and campsites are usually full on weekends. People leading evening programs are interpretive staff and SCAs. There are some VIPs (NPS volunteers). The park has numerous interpretive trails, including the Bear Gulch Trail Guide: The Six Bridges Nature Walk, the Balconies Trail Guide, the Moses Springs Trail Guide, and the Geology Guide. There are also short trails leaving from the campgrounds that could be used as phenology interpretive trails. The parks General Management Plan is scheduled to be completed in 2012.

Education Programs:

As of September 2011, PINN is a Parks As Classrooms park, with curriculum for grades K-8. There are 2 seasonal, paid staff members and SCA interns that present the curriculum. BG Horvat is currently the interpreter at the park who would know the most about PINN education programs.

They do have a partnership non-profit organization similar, called ***Pinnacles Partnership*** (<http://www.pinnaclespartnership.org/about/>). The 8-member board has been primarily trying to raise money. The partnership is still quite young – less than five years old – and is still growing. The organization is still finding its place but despite its small size, there is lots of momentum and energy behind it. It could be a great part of the future curriculum for students to learn about climate change. In five years it has the potential to be a major contributor to park programs and projects.

One of their projects is the Pinnacles ***science camp***. Various iterations have occurred over the last few years. This is in the infancy but it will continue to grow. Phenology could be part of this and spring would be the best time to incorporate this theme. The target audience right now for the education programs is comprised of elementary school students.

Volunteer Programs:

They have a very well developed volunteer program for such a small park. The park has a full-time volunteer coordinator who works in resource management, which would be a good place to incorporate phenology. There is also staffing dedicated to working with volunteers every weekend, and this group could become strong in phenological monitoring, as most volunteers return every year, and some visit the park on a weekly basis. The park therefore has a strong volunteer base and they have the capacity to do outreach, including the distribution of outreach materials). The park works with Boy Scouts and Girl Scouts; the troops mostly focus on habitat restoration. The park hosted over 500 volunteers in habitat restoration alone in 2011.

Other Contacts:

New Chief of Interpretation expected Winter 2011

Denise Louie

Chief of Resources

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--extensive knowledge on the resources and flora of the park

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Bio Science Technician and Volunteer Coordinator

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--extensive experience in volunteer coordination and outreach

BG Horvat

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Veronica Johnson

Volunteer Coordinator

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--Ronni has extensive experience in volunteer coordination and outreach and education.

Paul Johnson

Wildlife Biologist

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--knowledgeable about pollinators and a good resource for general natural history.

Michelle Armijo

Park Ranger

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--involved with education programs.

Point Reyes National Seashore

Individuals Interviewed:

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Best Opportunities For Phenology:

Focused on vegetation, volunteer programs at PORE are extensive and highly supported by the local community (among those who support the park).

General Notes on the Park:

The park is fairly spread out, and the easiest part to get to is Bear Valley. The biggest challenge is that they have a small staff which must run activities at three visitor centers. Because most staff are answering questions in the visitor center, they do not have enough additional staff to offer any programs outside of the visitor center.

PORE does not have programs for the general public or school children focused on plants; plant-based curricula is limited to describing plants as part of a habitat and mentioning Native American uses of plants. They have offered ranger talks on vegetation in past on the Chimney Rock Trail, which requires a ranger. The feeling has grown, however, that there has not been enough turn out to justify the effort required to offer botanically-oriented programs; for example, typically only three to four people show up. In sum, visitors to PORE are not as interested in programs about plants as they are in animals, Native Americans, and geology. This is in contrast to Yosemite national park, to which visitors will travel specifically to see the sequoias. In PORE, the vegetation just isn't as compelling to the public.

Interpretive programs:

Native American outdoor program meets every Sunday at 2:00 pm at the main visitor center in Bear Valley. In this program, rangers talk about plants with regard to encroachment of non-native species into native plant communities.

Science on the Sphere is an indoor program in which park staff speak about global phenomena, including climate change. Most interpreters who offer this program incorporate information on how human activities affect climate. In the summer, this program runs daily at 11:00 am. Over the rest of the year, it is offered Saturdays and Sunday at 11:00 am. The program runs for 30 – 60 minutes.

Saturday earthquake program: 2:00 pm at Bear Valley. Duration: one hour

Sunday Coast Miwok program: 2:00 pm at Bear Valley. Duration: one hour

Day tours of the light house: Daily tours except on Tuesdays and Wednesdays. Duration; 20-minute tours

Junior Ranger programs: PORE offers a Junior Ranger program that is self-guided for children and their families. Each of the three visitor centers offers a Junior Ranger program with a different emphasis, as follows:

- Bear Valley visitor center is focused on the Miwok people
- Drakes Beach visitor center is focused on ocean mammals
- The Lighthouse visitor center is focused on the history of pacific navigation.

At each visitor center, students are given a book in which they must complete a minimum of one section to earn a patch. Earning a patch generally takes less than a couple of hours. Visiting school groups do not do these activities.

Education Programs:

The park website offers descriptions for teachers of programs and activities appropriate for different age groups: <http://www.nps.gov/pore/forteachers/index.htm>

General Notes: Teachers decide which programs they want to incorporate. The park has a reservation system that opens in early August and which teachers may call. There is no “Rangers in the Classroom” program. Classes generally visit once per year; there are no continuing programs. The park tries to offer a variety of outdoor programs that meet California curriculum standards, but there is nothing so far on climate change.

Contact for number for reservations is 415-464-5139. Class size is limited to 30. Programs are offered from September to May. Ranger-led programs are not offered on Mondays, Fridays, or on federal holidays.

Discovering Northern Elephant Seals

Target audience: 6th-8th grade. Duration: 1.5 hours (although the program can barely cover what is needed in this timeframe)

History: 10 years ago a suite of programs including elephant seal and grey whales was developed. Compared to the Miwok program, these are not very well attended (~100-150 students per year), presumably because these programs do not really match what teachers need. There is no significant vegetation at this beach site, where the winter program covers elephant seal mating and pupping activities in PORE (the seals come to shore in January to mate and return later in the year to molt).

Kule Loklo (Coast Miwok) Program

Target audience: 3rd and 4th grades. Duration: 1 hour

Between 6,000 and 7,000 students attend this program yearly, plus 1000 adults. The program meets at the edge of park near Bear Valley, which is the easiest part of the park to get to.

This program fills a gap in the elementary curriculum; consequently this is the program in highest demand by local schools. There are few places in the Bay area where students can go and learn about the traditions and lives of coast Miwok people. To introduce phenological themes, the rangers could identify native plants as they walk to the village and discuss how Miwok people use these plants across the seasons. Incorporating climate change might be too much.

The following programs are less popular:

Monitoring Creek Health

Target audience: 6th-8th grade
100 students per year

Focus is on the recovery and lack of recovery of Coho Salmon and Steelhead Trout. Students monitor creek water pH, dissolved oxygen, and temperature.

Uncovering the San Andreas Fault

Target audience: 5th-8th grade.

30 students per year.

High School Programs:

The park offers an **estuarine/marine science program** for high school students. The program runs for a few weeks every summer. Phenology could be included, but it would not provide consistent coverage throughout the season.

The park offers a **high school and college internship program**. It would be possible to have an intern complete a phenology route as needed.

Volunteer Programs:

Doug Hee is now managing the extensive volunteer programs, which focus on snowy plover, thule elk and elephant seal activity. Each program has different volunteer coordinators. Starting a new program on phenology would require a park staff person to run it, most likely from the resources division. Most volunteers are local residents.

There are two monitoring programs that focus vegetation:

Native Seed Collection: Volunteers collect native seed for propagation and reintroduction of these species into reintroduction areas. Approximately 40 people participated last year on a regular basis. Volunteers undergo training to identify plant species. This work needs to happen on specific days when seeds are available to harvest.

Weed Watchers: Volunteers identify potentially invasive plants. 18 people participated on a regular basis. Work days are arranged around when people are available. The schedule is very flexible.

Contact: Melanie Gunn, PORE Volunteer Coordinator

Technology in the Park:

Park staff are working towards developing a cell phone tour on the Earthquake trail; they have a contract to do this with One cell. One challenge with this approach is that the internet is spotty throughout the park.

Contact: John Dell'Osso, Chief of Interpretation

Other Contacts:

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Redwood National and State Parks (REDW)

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Best Opportunities for Phenology:

REDW covers a wide latitudinal gradient, so phenological monitoring should take advantage of the opportunity to sample a long north-south transect by establishing sites in both the North and South districts. Currently, the North District has a larger volunteer pool, so this may be the population that is best to engage with here, emphasizing monitoring in locations where volunteers are currently active. Humboldt State University and College of the Redwoods and the Osher Lifelong Learning Institute (OLLI) also offer opportunities for recruiting volunteers for phenology monitoring in the South District.

General Notes:

The 2011 CPP seasonal intern is particularly energetic and has taken the initiative to set up his own phenology trails with geo-referenced plants.

There are no guided walks in January.

A challenge here is that at least two of the species selected for monitoring have low survivorship rates: *Lathyrus littoralis* and *Trillium ovatum*. Replacing individuals lost between monitoring dates could become a nuisance.

Interpretive Programs:

Trail roving: Interpretive staff visit trails and focus on informal interpretation with park visitors they encounter on the trail.

Nature/Forest walks: There is at least one walk at both ends of the park each day of the week, and the walks usually cover one of six interpretive themes. At the North end of park, walks are usually scheduled at Stout Grove and Simpson Reed Grove. At the South end of park (where the staff is much smaller), there is usually a single afternoon walk to Lady Bird Johnson Grove. Walks are usually 1-2 hours long. Visitors show up at the appointed time to participate in the programs (it is not necessary to sign up ahead of time).

→These walks would work well on phenology trails!

Junior ranger programs: 1 hour programs

- **State Park Junior Ranger program:** activities are conducted in the state parks near the park visitor center; kids earn awards (badges, pins) for participating; there is a notebook on the State Junior Ranger Program published by the State of California.
- **National Park Junior Ranger program:** Junior Ranger newspaper of activities that kids can do in the park; will be web-based; Self-guided activities; Nate St. Amand is the contact person at REDW.

Campfire programs: These 1 hour programs are conducted at the three state parks (Prairie Creek, Mill Creek, and Jediah Smith State park), since the campgrounds are in the state parks. The program usually begins at 8 or 8:30 and is run by NPS interpretive staff. It might be possible to introduce phenology and phenology monitoring in these programs

Visitor Centers: The visitor centers offer great opportunities for engagement with park visitors. Park staff provide visitors an orientation to the park. Visitor centers also include exhibits, videos, and other information about the park. Some of the REDW visitor centers are more difficult to find, however, so visitors don't make it to the center before their visit. Many visitors stop in to the Kuchel Visitor Center at South end of the park; CPP could develop a demonstration phenology trail here.

See this link for a description of some of the interpretation programs:

<http://www.nps.gov/redw/planyourvisit/ranger-programs.htm>

Education Programs:

The park website offers descriptions “for teachers” of programs and activities appropriate for different age groups: <http://www.nps.gov/redw/forteachers/index.htm>

Lynda Mealue is the education coordinator at REDW.

Two outdoor schools are affiliated with REDW:

Howland Hill (<http://www.nps.gov/redw/forteachers/howland-hill-outdoor-school.htm>). This outdoor school offers recurring day programs at the northern end of the park directed at 1st- 4th grade students. First, a park ranger provides a classroom visit, and then students come to the outdoor school. The material introduced is linked to CA state standards

Contact: Howland Hill technician: Susan Davis-- may already be using some budburst protocols

Wolf Creek Education Center (<http://www.nps.gov/redw/forteachers/wolf-creek-education-center.htm>). This facility provides residential 2.5 day programs at the southern end of park, covering stream, forest, riparian, and grassland/prairie educational units. Students learn common names for plants, conduct water quality assessment, macroinvertebrate surveys, and use field notebooks to record observations (*Nature's Notebook would fit in well*). SCA interns participate in this program, leading visiting student groups.

Contact: Wolf Creek technician: Susanna Ausema

A local school, **Orick School**, is located close to the South Operations Center (SOC). They already have a garden, where a phenology demonstration site could be set-up. The principal joined in during the first CPP workshop at REDW (in June 2011) during CPP visits and training and has subsequently met with REDW staff to further explore the phenology garden concept.

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South District (based in Orick):

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Stassia Samuels, Plant Ecologist and CPP Core Team (see contact information above)

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Santa Monica Mountains National Recreation Area (SAMO)

Individuals Interviewed:

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Park Ranger; oversees Eco-helpers program
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Christy Brigham
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CPP Core Team
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Best Opportunities for Phenology:

There are a number of interpretive and education programs where phenology could easily fit in. The best options are covered below.

Interpretive Programs:

Junior Ranger programs: These are self-guided, but one could be developed on phenology; kids may earn an iron-on patch or plastic badge, with up to 3 pins if a ranger signs off on the Junior Ranger sheets.

Geocaching: CPP might be able to link phenology with this program or recruit geocaching participants to volunteer groups engaged in phenological monitoring.

OUTDOORS events: These events include interpretive walks (Jack Gilooly), flower walks (Shyla), cultural walks, and more. Most events are offered on a regular basis. Satwiwa Culture Center (Rancho Sierra Vista) would be a good location to develop something for the general public (also has a native plant garden and hiking trails). See website at: <http://www.nps.gov/samo/planyourvisit/events.htm>

Education Programs:

The park website offers descriptions for teachers of programs and activities appropriate for different age groups: <http://www.nps.gov/samo/forteachers/index.htm>

SHRUBS program: In this program, students help to restore unique biomes at SAMO. The program includes multiple visits by 5th grade students (this is currently the *only* multi-visit program running in the park). Students at one nearby school visit three times, with an additional visit that may include family members. Students at EARTHS Magnet School visit SAMO 8 times and might be able to participate in phenological monitoring. EARTHS also has a native plant garden on campus, where students might be able to participate in additional monitoring. See website: <http://www.conejo.k12.ca.us/earths/Program/SHRUBS.aspx>

Kate Eschelbach has also established schoolyard habitats, so that students can collect data on campus, as well as in the park.

The Chumash program: This is a single-visit program lasting 1.5-2 hours, for 3rd and 4th grade students. The students visit Rancho Sierra Vista (aka Satwiwa) center and focus on biological diversity (e.g., why did the Chumash need biodiversity in order to survive?). It might be more difficult to integrate phenology into this program, since it might be more challenging to fit phenology into the state standards this program tries to fulfill. However, seasonal cycles of plant growth and reproduction were surely important for indigenous populations.

Parks as Laboratory (PAL): This comprises a 6th and 7th grade curriculum, including a 2-hour visit. Cathie Dunkel is the program manager; she would like to see a different program developed in place of the park's current lab program, and science teachers will be coming during summer 2011 to help develop a new program. ***The PAL program might benefit the most from integrating phenological monitoring, and the park is really interested in any help the CPP could provide and a partnership here!***

Ecohelpers: Anthony Bevilacqua oversees this program. After attending the UCSB phenology workshop in 2010, the park wanted to implement phenology monitoring and now has a pretty good set up at Zuma Canyon. This program comprises a one-time visit for 9th grade high school students (up to 50 students), and the whole program is focused on climate change and phenology. Ecohelpers currently uses the Project Budburst data sheets, recording observations on *Sambucus mexicana* (= *S. nigra*).

Participating Ecohelpers students are given a short ecology lesson on climate change and phenology and then split up into 2 groups of 25 students; one group plants native plants and the other group goes on a hike. There are lots of *S. nigra* individuals at the beginning of the trailhead; the group observes three shrubs and then continues on with hike. They currently observe one plant all together, and then smaller groups (~5 students in a group) observe the other plants. The planting and hiking groups then switch places and do the other activity.

Data entry into the on-line databases has not occurred; perhaps a seasonal worker could upload all data at the end of the spring season. Use of Nature's Notebook would have the advantage of not requiring students to observe first events.

See program website here: <http://www.nps.gov/samo/forteachers/ecohelpers.htm>

Cal State University Channel Islands Course: Lisa Okazaki will be working with Don Rodriguez, Ph.D., CSUCI Chair of the Environmental Science and Resource Management Program to offer an ESRM 490 special topics course (3 units) from January through May 2012. Up to 15 students may register for the course and will learn:

- about the National Park Service & Santa Monica Mountains National Recreation Area;
- about phenology & the National Phenology Network;
- how to conduct a field education program for elementary and middle school students;
- how to collect phenological data and input data in Nature's Notebook.

After receiving training, CSUCI students will observe, assist, and then present phenology education programs to elementary and middle school students in the park. Education programs will be conducted once a week. When CSUCI students are not conducting an education program, they will collect data in the park and input data in to Nature's Notebook.

Technology in the Park:

Smart phone application: John Tiszler is the lead on this project. Eric Graham at UCLA says the app is finished, and they just need to pick the plants and get photos of phenophases incorporated.

Possibilities for developing a citizen science program:

Research Learning Center: Susan Teel, Director of SAMO RLC. All research learning centers (RLCs) are project-based and funding is limited; there is no staff to do research, only to facilitate its development, although they do have some funds to staff interns and seasonal employees and enjoy a large number of contacts with schools and other partners (e.g., CNPS). The role of the RLC is to facilitate any funded project led by scientists or NPS staff; they also offer workshops, lectures, communication products, articles in peer-reviewed journals.

The clients of RLC activities are the educated public, college and university students, and faculty; they don't work with children. The RLC could help to recruit a workshop audience, including from CSU Channel Islands and the CNPS (Contact: Dr. Don Rodriguez, CSUCI).

CNPS Fellow and Mountains Restoration Trust Program Director, Jo Kitz, leads hikes and works in partnership with the Santa Monica Mountains community to acquire land and easements for conservation.

Note: There is an annual Education Consortium meeting at SAMO, including: the Children's Nature Institute, State Parks, NatureBridge, Resource Conservation District of the Santa Monica Mountains, Cold Creek Docents, Malibu Creek Docents, Mountains Recreation and Conservation Authority, Mountains Restoration Trust, Nature of Wildworks, and UCLA – the CPP could be placed on the agenda to discuss citizen science programs. Contact the chair.

<http://samofund.org/SMMEC/SMMEC.htm>

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Sequoia and Kings Canyon National Park (SEKI)

Individuals Interviewed:

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Stephanie Sutton (3.2,2011)
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Best Opportunities for Phenology:

The current budget situation is not great at the park. It would be best to incorporate phenological programming into existing programs; for example, the CPP might work towards integrating phenology demonstrations into a patio talk or a forest walk. The CPP should also further develop education and volunteer programming already in place-- e.g. SPROUTS and Courage to Change programs.

General Notes on the Park:

SEKI is a very big park, with three districts. The elevational change within the park is extensive, so each area has a distinct climate and vegetation; each district also has a very different visitor base.

- (1) ***Kings Canyon district***: includes Grant grove and Cedar grove (Kings Canyon Visitor Center in Grant Grove and Cedar Grove Visitor Center in Kings Canyon itself)
- (2) ***North Sequoia district***: Lodgepole/Giant Forest Area (Lodgepole visitor center)
- (3) ***South Sequoia district***: Foothills and Mineral King Area (Foothills visitor center)

Interpretation Programs:

The Kings Canyon and North Sequoia districts offer regular programming at Giant Forest, Lodgepole, and Grant Grove (by Sequoias) which attracts a very traditional national park audience. These offerings include: ***2 hour walks in the Realm of the Giants; 20 minute talks at the General Sherman tree; formal walks through the Giant Sequoia grove at Grant Grove; patio talks at the visitor centers; and various evening programs.***

The Foothills (aka South Sequoia district) attracts a non-traditional visitor base, comprised largely of the local Hispanic community that comes to escape the heat and enjoy the river. The park offers several ***informal programming opportunities*** near the river, including: touch-table for kids and parents, wildflower walks, and short hikes (limited due to the extreme heat).

Education programs

The park website offers descriptions for teachers of programs and activities appropriate for different age groups: <http://www.nps.gov/seki/forteachers/index.htm>

SPROUTS: This is a phenological monitoring program for 5th and 6th grade students, largely in the classroom. The objective is to connect students to the park, using a series of programs that build on each other, with themes emphasizing life zones, watersheds, climate change, etc. Its curriculum was written largely by GIS seasonal and education technicians. The climate change program and focuses on climate change and scenario planning to help students understand the potential impacts of a changing climate on various species while SPROUTS uses a methodology called Understanding by Design to help students discover what phenology is and how to detect phenological changes in oak trees.

The students observe the phenophases of valley oaks and compare their phenology to the blue oaks in the park via web cams (see website below for link to web cams). The webcams are not engaging the students or other web visitors to their full potential; there's a need for more dynamic materials.

SPROUTS was piloted in the 2010-2011 school year in a single 6th grade class, but additional curriculum development is needed, including pre- and post-program activities, an activity journal and perhaps a trunk of materials for the classroom. The pilot teacher has a strong background in the sciences and offered her students at Cottonwood Creek Elementary school (Visalia, CA) as the pilot students. They may be willing to share this and all forthcoming climate change curriculum with CPP so that it could be tested in other parks.

Online materials are available at: <http://www.nps.gov/seki/forteachers/sprouts.htm>

Rangers in the classroom (<http://www.nps.gov/seki/forteachers/curriculummaterials.htm>): SPROUTS is part of this program, which offers 1 hour classroom visits to elementary schools throughout Tulare County. The program is run by Sequoia South district and offers programs such as *The Bear Essentials*, *Explore Your Watershed*, and *Meet Your National Parks*.

Volunteer Programs:

Courage to Change: This is a residential program (9mo-2yrs) for young people with history of gang and/or court involvement. There are approximately 50 kids in the program at any time, and they are ranked categorically by behavior/progress/etc. The kids can attend school on campus or can enroll in Exeter High School.

A group of Courage to Change students visit SEKI every Tu/Th throughout the year (Feb-Nov). They usually work in foothills, but they have done jobs in other areas of the park as well. Any

CPP monitoring location close to Ash Mountain would be convenient for this program (they always stop at the Ash Mountain Visitors Center on the way into the park). There is also potential to install a native plant garden on-campus (15-20 acres in Exeter); the school already has a veggie garden, and students already work in native garden at SEKI.

As of November 2011, SEKI does not have a VIP coordinator to run this program-- if the VIP coordinator is made into a term or permanent position in the future, this might be an option to explore.

There are a number of opportunities for engaging the local community: The *local CNPS chapter* would likely be a good candidate, as well as the local *Garden Club*, which already has a garden in Three Rivers. Setting up programs in the foothills area is a good idea, since these areas are likely to be visited more frequently than high-elevation areas of the park (especially by the local community).

Technology in the Park:

SEKI Facebook page: Offers a chance to interact with people at other parks or other programs through social media. It might be possible to connect webcams to this or other social media.

A *phenology page for SEKI* could also make the connection between different parks; this is possible to incorporate in the future *CPP website*.

Other Contacts:

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Matt Fagan

North Sequoia/Lodgepole District Interpreter
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Krystina Webster

Lodgepole/Giant Forest Subdistrict Interpreter
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--responsible for in-park shuttle operation, which falls under "interpretation"
--10-15 seasonal workers do a variety of formal programs

Denise Robertson

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Sequoia South
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Within each district, the interpreters wear a lot of hats; Denise is Stephanie's supervisor. Denise supervises three people directly + five education technicians + volunteer in the parks

coordinators + 1 seasonal employee and 1 intern in the Mineral King Area, which is 1.5 hours away from headquarters. Stephanie supervises up to 7 seasonal employees + 1 permanent employee and 1 intern at the Mineral King area, which is 1.5 hours away from headquarters.

Whiskeytown National Recreation Area

Individuals Interviewed:

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Jeremiah Hockett
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Best opportunities for Phenology:

The best opportunities seem to be in the volunteer programs, which have a large dedicated base of mostly retired individuals with flexible schedules. Similar to other parks, WHIS is constrained by current staff shortages.

General Notes on the Park:

Most of the science in this park occurs in the natural resources division, where there is no full-time botanist. The park has a very small interpretive staff with two permanent and three seasonal staff members. At present the natural resources division is not monitoring phenology, and they have not been using volunteers to do monitoring at large. Pressing ecological issues at the park include habitat restoration, invasive species, and endangered species. Other issues that require ongoing attention include the following:

- Mines in the park contaminate water bodies with mercury, and this is especially pressing because of the human health issues involved.
- Sedimentation issues from logging roads affect anadromous fish habitat.
- Spotted owls and bald eagles are threatened and endangered.
- The rare perennial grass, *Puccinellia howellii* (Howell's alkali grass) is restricted to a single one-acre salt spring at WHIS and is the focus of ongoing mitigation (see the 2007 restoration and monitoring plan by David Cooper and Evan Wolf)
- Marijuana is cultivated illegally in the park

- Invasive plants are another major issue. Some of the most invasive non-native plants at WHIS are tree of heaven (*Ailanthus altissima*), Himalayan blackberry (*Rubus armeniacus* or *Rubus discolor*), mullein (*Verbascum thapsus*), yellow star thistle (*Centaurea solstitialis*), and Scotch broom (*Cytisus scoparius*), French broom (*Genista monspessulana*), and Spanish broom (*Spartium junceum*).

Interpretive Programs:

Junior Ranger programs are geared toward 7-12 year olds and focus on natural cultural history of the park. The program takes place on weekends in the summer. There is a strong opportunity to tie in phenology here, particularly because park staff would like to revise the program and raise additional funding.

There is also a **Junior Firefighter program** focused on firefighting, safety, and NPS prescribed fires (target audience: 7 to 12 year olds).

Last summer WHIS introduced a **“toddler ranger”** program for groups ages 3 to 6.

There is also a **story time program** geared toward pre-school children.

The park offers **evening programs** near the Oak Bottom Campground in the amphitheater. This is a 1 hour program run by interpretive staff. Rangers have a lot of freedom to develop different topics for these programs. These evening programs tend to focus on wildlife and a little on climate change. When it comes to environmental issues, these lectures focus on sustainability.

Interpretive walks include:

Waterfall Week (early to mid April), when the park offers hikes to waterfalls. In summer, the park offers a few hikes, but they do not always get a great response because it is so hot.

Walk in Time (also called the gold rush program for California school program), a two-hour program on the gold rush history of WHIS that takes place at Oak Bottom Amphitheatre. There are lots of opportunities in this program to look at “then and now” vegetation and general changes in the land. The program includes a visit to an orchard with trees 160 years old. A current theme in this program is how the landscape was changed in the transition from Native American occupation to European resettlement (including the gold rush).

Wildflower walks in the spring, which take place on different trails in the park, using established trails such as Davis Gulch Trail, Guardian Rock Trail, and Mount Shasta Mine Loop Trail. Rich Hayes is interested in assisting with these hikes during the spring of 2012 and can lend his assistance with interpretive walks including phenology.

Interpretive Trails: Davis Gulch Trail is the closest thing they offer to interpretive trails. There used to be an interpretive trail at the visitor center, but it needs to be updated. They have a native plant garden at the visitor center with a guided numbered walk. The **Shasta Divide** nature trail (a short loop) has posts where different plant species are identified. This also needs to be updated.

Education Programs:

Whiskeytown Environmental School was affiliated with the N.E.E.D program from the 1960s and is now run by the Shasta County Office of Education. It is located on-site and offers day programs where students come out for the day and focus on pond and creek studies at Clear Creek (2-8 grade). Related to this environmental school, Jeremiah leads a Monday evening 75-minute program on the NPS mission and the natural and cultural resources of park. The main objective is to give participants a sense of the history of the park, why the park is important, and how they can be good stewards. This takes place at the N.E.E.D Camp Amphitheatre.

They also offer resident programs for 5th and 6th grade students for 3-5 days with naturalists that lead hikes on trail networks. Schools have almost exclusive access to NEED camp trails, which are not on the map and are mostly closed to the public.

The park also offers some off-site programs at individual schools (second grade focus primarily) on habitat, and school visits with the story time (pre-K) program

A pre-kindergarten to second grade program (no name) that is focused on *wildlife tracking* takes place at Brandy Creek Beach. The students locate real wildlife tracks along the beach area and make plaster casts. A *habitat program* is often tied in with this tracking exercise.

A graduate student from southern Oregon is aiming to align the program with the revised curriculum standards (EEI) as a way to incorporate environmental education into any existing education program. EEI alignment had been completed by John Duwe.

Natural resources students from Humboldt State also visit the park and participate in the fire ecology and wildflower walks with Jennifer Gibson.

Volunteer Programs:

The park staff tend to focus on issues in which they have expertise. Accordingly, Jeremiah Hockett coordinates volunteers who have a background with people at resources. Few in the interpretive or volunteer divisions have scientific backgrounds. They do recruit volunteers when there is a specific need that volunteers can fill, but they struggle to provide regularly scheduled programs for volunteers and they do not have the time to supervise them. It is highly possible that they could recruit volunteers for phenological monitoring, but training and supervising them would be a challenge.

Recently, the park conducted a broad recruitment for volunteers to help at the visitor center and had a great response. WHIS attracts many retirees who are looking to give back to the community.

Volunteers in interpretation are mainly placed in informational positions. Some volunteers help with educational programs, but these tend to be historical programs rather than biological

programs. Many volunteers participate in the kayaking programs in which volunteers might be able to contribute some general phenological observations. Nevertheless the volunteer coordinator noted that “most people are just out to have fun and splash around, so it may be difficult to tie in any rigorous scientific phenological monitoring. Certainly there is an opportunity to talk about phenology on the kayaking trips but monitoring might be challenging.”

Lots of park volunteers are retirees with a variety of backgrounds. Many are available to work nearly full time and will “do just about anything” the volunteer coordinator asks them to do. He was confident that they could plug people in on phenology and they would be reliable and consistent.

Volunteers also help with evening programs. One volunteer (Rich Hayes; see contact list, below) is a former ranger amateur naturalist and he would like to develop a program on wildflowers. He is especially tuned into seasonal changes so phenology could fit in here.

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-- Jeremiah's supervisor; he handles all of the park interpretation.

Sean Denniston

Chief of Interpretation and Resources Management

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Volunteer:

Rich Hayes

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Appendix A – Questions Used to Guide Park Interviews

Participating Park Interview Questions (These Interviews conducted by Margot Higgins)

To: CA Phenology Project Park Point of Contact,

The CA Phenology Project (CPP) team requests your assistance in completing a set of questions to inform development of education and outreach activities and tools. As a park point of contact (POC) for the CPP you have already learned about this project via project briefing webinars and emails. For your reference a number of project materials, including a project fact sheet are located at the following website: <http://www.usanpn.org/cpp>.

The CPP seeks to develop, test and implement phenology monitoring in parks throughout California as a way of understanding the effects of climate change on park resources and at the same time offering opportunities for citizen participation and education. In an effort to make the activities and outcomes of this project most relevant to individual parks we are seeking information on your park in the following areas: 1) type and scope of existing education/outreach programs and tools; 2) understanding how the park is addressing climate change and/or phenology in these programs 3) park relationship to local communities; and 4) identification of park needs and opportunities related to the CPP.

If you have any questions, please contact, Margot Higgins at 510.647.8861, margothiggins@berkeley.edu or Angie Evenden 510.643.0665, angela_evenden@nps.gov

Thank you for agreeing to complete this interview. We know how extraordinarily busy you are, and we really appreciate your time.

General Information

- 1. What park do you represent?**
- 2. What is your current job title?**
- 3. Do you believe that some of the effects of climate change are visible in the park where you work? Please explain.**

Park Visitors and Local Communities

- 4. Do park visitors seem concerned about climate change? Please explain.**
- 5. What communities do you consider to be local to your park? Please list.**
- 6. Please describe your park's current relationship with the local community(ies).**

7. How can your park better engage members of the local community?**Existing Park Education/Outreach Programs**

8. Please list your park's existing education programs and outreach activities (e.g. ranger talks, rangers in the classrooms, etc.). For each program/activity indicate the target audience/age groups involved, the partners involved and approximately how long the program or activity has been in place.

9. Does your park already offer or host citizen science programs?

_____ YES _____ NO

10. If yes, please list the citizen science program(s) and provide a brief description of the audience/age groups involved, the partners involved, the year the program was initiated and if the park or a partner is responsible for its implementation. Note: 100 character limit per text box entry.

11. Do any of the education/outreach programs/activities or citizen science programs listed in questions #8 and #10 address phenology or climate change?

_____ YES _____ NO

12. If yes, please list the specific program/activity again here and briefly describe the linkage with climate change and/or phenology.

13. How are local communities and citizens engaged in programs and activities identified in Questions #8 and #10 above? Please describe.

14. Do you currently use any of the following technologies in your education and outreach activities? Please describe.

- Podcasts
- i-phone applications
- online networking sties such as facebook
- other

15. How informed is your interpretive staff about climate change?

- not very informed
- a little informed
- very informed

16. Has your interpretive staff received previous trainings on climate change?

- yes
- no
- I do not know

Park Needs and Opportunities

The CA Phenology Project is designed to develop and test protocols for monitoring plant phenology while providing opportunities for citizen engagement and for climate change education. We would like to develop, apply and test a variety of techniques for citizen engagement and education across the 19 involved parks during the project pilot phase (2011-2013). At the end of the pilot period we intend to compile what we have learned in a web-accessible tool kit for parks and others to use. Your answers to the questions below will help our team understand how the CA Phenology Project can best serve your park in addressing climate change related education and outreach needs.

17. Are there existing park education and outreach programs that the CA Phenology Project can dovetail with or that can serve as a model for a phenology program? Please share your thoughts below.

18. Is the park interested in exploring the use of phenology to develop new partnerships or programs in the park? If so please specify.

19. What would be the most effective ways for your park to gain assistance in implementing climate change education programs utilizing phenology monitoring?

- help us expand existing education programs to include climate change
- give us case studies or examples from other national parks
- provide training for interpretive staff
- (*or)provide training in climate change science
- provide more research about visitor understanding of climate change
- help us better develop communication strategies on climate change
- help us develop new technologies such as an i-phone application
- other (please specify)

20. How would you like to receive information that might assist you with your climate change education and outreach efforts?

- workshops/in person meetings
- develop curricula on climate change
- downloading information from the Internet
- print (hard copy) materials
- Webinars/conference calls
- E-mail
- other (please specify)

21. Would your park like assistance in creating more targeted curriculum on climate change for various audiences?

22. What are the greatest benefits that you anticipate surrounding the implementation of climate change education and outreach programs in phenology?

23. What are the biggest challenges that you anticipate surrounding the implementation of climate change education and outreach programs in phenology?

24. Which park interpretation staff would you envision being involved with a phenology program?

25. How much does management support staff training and involvement in climate change interpretation and citizen science?

26. Please provide any additional comments or guidance here.

Thank you for taking the time to participate!

Pilot Park Interview Questions (These Interviews Conducted By Susan Mazer and Liz Matthews)

We're seeking information that will help us to figure out whether we should:

- a) try to integrate the teaching of phenological concepts and monitoring into current programs, or
- b) invent brand new programs that follow the kinds of templates that park staff are already comfortable with.

To achieve this, we first need to be able to envision the format, content, and duration of each park's current "programs" that are related to the observation of the natural world and/or to climate change. By duration, we don't mean *how long* a program has been used in a park, but rather how many minutes/hours of contact comprise each program and whether it's a one-time vs. repeated type of activity.

For example, from a visitor's point of view, for each program offered by a park:

-What is the name of the currently offered program? (e.g. forest walks, junior ranger programs, campfire programs, environmental education or outdoor schools, etc.)

-How long is the program? (e.g., 9 am - 10:30 am, on Saturdays; a given visitor attends only once)

-What time of the day and part of the week is the program held? (day or night; weekdays or weekends)

-Where is the program held? Is the program held indoors or outdoors?

- What activities are included in each program? (e.g., one 15-minute video +a question-answer period + a one-mile trail walk, etc.)
- What is the usual staff: visitor ratio for each program? (e.g., 1 park ranger + 1 seasonal staff member + 14 visitors)
- What are the names, titles, and roles of the interp staff members who run each program?
- What are the characteristics of the attendees of each program (e.g., 10-12 year olds, families, visiting teachers, volunteers, etc.)?
- Do attendees in each program attend a single program event or is there a longer-term relationship between the attendees and the program? (e.g. rangers programs that visit elementary school classrooms and later host students during a park visit)
- What are the learning goals of each program, or what skills are gained by participants? (e.g., how to recognize three species of conifers; understanding the difference between male cones and female cones; learning how to use a GPS unit, etc.)
- What on-line materials are available that are either used in each program or that describe each program?

For example, is a "program" a one-hour event where visitors listen passively to a video or a podcast? Is it a tour of 10 people along a trail? Is it a tour of 20-30 people? Do visitors make observations and record them? When does each program occur? Are there any programs that involve multiple visits?

Finally, are there specific skills that would be useful for the CPP team to teach during our visit? (e.g., identification of phenophases, basic botanical concepts, how to use the NPN Nature's Notebook, etc.)