complex in the Jemez Mountains, New Mexico. This volcanic center, located at the intersection between the Rio Grande rift and the Jemez volcanic lineament, is composed of the Valles caldera (1.25 million years old) and the older Toledo caldera (1.61 million years old). The morphologically intact Valles caldera is a classic example of a resurgent caldera, exhibiting a resurgent dome elevated more than 1 kilometer above the caldera floor, as well as world-class examples of zoned ignimbrite outflow sheets (the upper and lower Bandelier tuffs, with a combined volume of more than 600 cubic kilometers).

Impressive megabreccias within the calderas, postcaldera volcanism (rhyolitic domes and tuffs), and an active caldera-hosted geothermal system exemplify the surface expression of recent caldera volcanism. Field investigation by *Smith and Bailey* [1968] at Valles produced a classic model of caldera formation, a seminal framework that has largely stood the test of time. A visit to this area was thus a fitting tribute to their pioneering work.

Overall, the innovative bottom-to-top approach, in both the online course and the field trip, successfully provided students with a broad, in-depth perspective of the complexity of caldera systems. The use of Marratech™ software was extremely effective in providing a highly accessible forum for presentation, discussion, and long-distance cooperation. Class and trip organizers hope that this innovative model can be used in the future for similar collaborative teaching efforts in volcanology and the Earth sciences.

References

Durant, A., W. Rose, C. Mann, and J. Stix (2007), Multi-university Internet video-conferencing course provides novel approach to student-directed learning, *Leading Edge, 26,* 1320–1321.

Elston, W. E. (1989), Day 5: Field guide to the Emory caldera along NM-152 and in Tierra Blanca Canyon, in *Field Excursions to Volcanic Terranes in the Western United States,* vol. I, *Southern Rocky Mountain Region,* edited by C. E. Chapin and J. Zidek, pp. 91–106, N. M. Bur. of Mines and Miner. Resour., Socorro.

Kennedy, B., and J. Stix (2007), Magmatic processes associated with caldera collapse at Ossipee ring dyke, New Hampshire, *Geol. Soc. Am. Bull., 119*(1-2), 3–17.

Smith, R. L., and R. A. Bailey (1968), Resurgent cauldrons, *Mem. Geol. Soc. Am., 116,* 613–662.

Wiebe, B., D. Snyder, and D. Hawkins (2000), Correlating volcanic and plutonic perceptions of silicic magma chamber processes: Evidence from coastal Maine plutons, field guide, 61 pp., Geol. Soc. of Am., Boulder, Colo.

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MEETINGS

Toward a U.S. National Phenological Assessment

Third USA National Phenology Network (USA-NPN) and Research Coordination Network (RCN) Annual Meeting; Milwaukee, Wisconsin, 5–9 October 2009

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Directional climate change will have profound and lasting effects throughout society that are best understood through fundamental physical and biological processes. One such process is phenology: how the timing of recurring biological events is affected by biotic and abiotic forces. Phenology is an early and integrative indicator of climate change readily understood by nonspecialists. Phenology affects the planting, maturation, and harvesting of food and fiber; pollination; timing and magnitude of allergies and disease; recreation and tourism; water quantity and quality; and ecosystem function and resilience. Thus, phenology is the gateway to climatic effects on both managed and unmanaged ecosystems. Adaptation to climatic variability and change will require integration of phenological data and models with climatic forecasts at seasonal to decadal time scales. Changes in phenologies have already manifested myriad effects of directional climate change. As these changes continue, it is critical to establish a comprehensive suite of benchmarks that can be tracked and mapped at local to continental scales with observations and climate models.

Funded by the U.S. National Science Foundation, this year's meeting of the Research Coordination Network of the USA National Phenology Network (USA-NPN) focused on delineating the possible scope and shape of a first U.S. national phenological assessment (NPA). The purpose of the NPA would be to inform citizens, decision makers, and scientists about important trends in salient aspects of phenological indicators. The first NPA would provide a summary of the current state of understanding of phenological variations and trends across the United States and establish a suite of baselines for key indicators to be prognosticated and tracked in subsequent NPAs.

Now is the time to undertake the first NPA for several reasons. The recent establishment of the USA-NPN provides groundwork for phenological monitoring and data dissemination. Moreover, there is an increasing awareness within federal agencies of how climate change may affect their missions. For example, in September 2009 the U.S. Fish and Wildlife Service released for public comment a draft "Strategic Plan for Climate Change." Furthermore, the first and subsequent NPAs could provide valuable input to the Fifth and Sixth Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC), particularly Working Groups II (impacts, adaptation, and vulnerability) and III (mitigation of climate change).

The meeting involved more than 3 dozen scientists from 24 different organizations, including universities, nongovernmental organizations, a private company, and seven federal agencies. Keynote speakers included Julio Betancourt (U.S. Geological Survey) on the need for a national assessment, Adam Terando (North Carolina State University) on trends in agroclimatic indices under recent and projected climates, Mark Schwartz (University of Wisconsin–Milwaukee) on the spring indices, and Abe Miller-Rushing (USA-NPN) on a proposed regional assessment of the northeastern United States. Participants were organized into one of four thematic groups—plants, animals, climatic and hydrological processes, and remote and proximate sensing of phenology—to identify pressing phenological questions and issues. Groups presented their questions in plenary sessions to solicit feedback from the other groups. Finally, each group produced a list of short-term (3- to 6-month) products aimed at advancing understanding needed to launch the first NPA. Discussions on moving the first NPA forward continued during the AGU Fall Meeting in the special session entitled "Toward Phenological Assessments: Regional, National, Global."

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