

notes from abroad

Editor's Note: David Parsons, Research Scientist at Sequoia/Kings Canyon NPs, represented the NPS Global Change Program Committee at an international workshop, "Earth system response to global change – northern and southern hemisphere contrasts," held in La Serena, Chile Nov. 30 to Dec. 4, 1991. The workshop was sponsored by the Chilean Academy of Sciences; the American Assn. for the Advancement of Science (USA); the Chilean, US, and Canadian IGBP (International Geosphere and Biosphere Program) Committees, and the McArthur Foundation. His report follows:

By David Parsons

The meeting brought together experts from such diverse fields as atmospheric science, oceanography, wildlife, vegetation, forestry, hydrology, biogeochemistry, and human geography to discuss the potential effects of global climate change on the west coasts of North and South America. Paired presentations were made on each of the above disciplines by leading scientists from each hemisphere.

The obvious similarities between Chile and the west coast of North America (located on the west coasts of continents, influenced by major oceanic current systems, similar climates, vegetation, and topography) provide many natural comparison bases. Differences in land use history and the ratio of land to ocean surface area in the two hemispheres lead to some differences in the projected impacts of increases in greenhouse gas concentrations on air temperature.

The Chilean scientists, with whom I was most impressed, and I identified many areas of potential collaboration between NPS sites in the western U.S. and sites in Chile. I was one of only two U.S. government representatives at the workshop, highlights of which follow.

The potential for using El Niño events as a surrogate for anticipated global warming was discussed. In 1968 and 1983 El Niño events (the two largest such in recent history) resulted in a 2 to 3 degree warming in the California Current and a shifting of currents to the north, thus shifting storm tracks as well. Unfortunately, the existing Global Circulation Models (GCMs) do not include ocean circulation patterns. There was much discussion as to whether increased CO₂ might increase the frequency of anomalous events such as El Niños, droughts, floods, etc. The shift in currents, ocean temperatures, biota (which will respond quickly), etc., might provide an interesting basis for work at Channel Islands NP or other west coastal sites.

Warming will not be uniform across the globe, and in fact, cooling might well occur in some areas. Faster and larger temperature responses can be expected over land than over the ocean and thus the relative amount of land and water will influence the rate of climatic response (e.g. temperature increase can be expected to be faster in the northern hemisphere where there is greater land mass). (Kevin Trenberth, INCAR, Boulder).

The best estimates show the global mean surface temperature has increased 0.5 C. over the past century. In the northern hemisphere this increase was largely before 1940. Decreases occurred in the 1960s and how a recovery to a new high point has occurred in the 1980s. (Trenberth).

Discussions of hydrology and projected increases in evapotranspiration demand on water identified the interior west and southwest of U.S. as most vulnerable

to climate change. (Rick Lawford, National Hydrology Center, Canada).

The presentation on intertidal systems (Jan Lubchenco, Oregon State) was a particularly clear outline of the sensitivity of these highly productive and diverse systems to predicted changes in sea level, sea and air temperature, and nutrients. I was struck with many implications for NPS coastal areas. Lubchenco also suggested that research programs may need to focus on targeted species: species at risk, species important to the system, or species important to global processes. She suggested attention be directed at the edge of species distributions (especially the thermal limit), at long lived species, at species with short dispersal distances, at pathogens, and at multiple stresses and rare events. These suggestions may be important for other ecological systems as well. (Note: Lubchenco is the next president of the Ecological Society of America – a valuable contact.)

Discussion of the importance of modeling the impacts of global change emphasized the importance of clearly articulating the questions being asked and the need to include process models. Problems of scaling and disturbance were emphasized. (Carlos Prado, U-Catolica, Santiago).

Wide ranging discussions of vegetation and plant responses included paleoecological analogs, documented changes in treeline, life cycle characteristics, dispersal modes, genetic constraints, and human impacts. I see several potential areas for collaboration with the Sequoia/Kings Canyon program (Sterling Keeley, Whittier College; Ha' Mooney, Stanford; Mary Arroyo and Juan Armesto, Univ. de Chile; Carolina Villagran, U-Catolica).

An excellent model of what could happen to animal species subjected to temperature increases (no change, evolution in place, migration, or extinction) was presented by Jim Brown (U New Mexico). He developed a specific example of the predicted extinction of small mammals on mountain tops in the Great Basin.

An evening discussion focused around the recent announcement of the U.S. government to support the concept of up to five regional research centers for global change, and that one of these should be located in Latin America. Despite obvious points in favor of Brazil for such a center, it was agreed that Chile could offer much as well, and that this would be pursued through appropriate channels. Discussion also focused on the value of developing a filter, or mechanism, to help determine what species, communities, and functional groups should be concentrated on for monitoring and process studies. A similar approach might be of great value to the NPS global change program.

Following the workshop, I met with faculty at both the Universidad de Chile (Drs. Arroyo and Juan Armesto and students) and the Catholic University (Dr. Eduardo Fuentes) regarding future collaboration. There was great interest in cooperation toward applying similar methodology to address questions of plant population biology, dispersal mechanisms, ecotone stress, climate and fire history, and developing comparable methods for long term monitoring.

I feel that my participation in the workshop was of value to the other participants, to the workshop products (which I helped write up), and to our global change program. The contacts made have potential for valuable spinoffs.