change, many natural adaptations have evolved within species to cope with these pressures. Conservation and management efforts can be most successful when they work in concert with natural adaptive mechanisms.

10:00-10:45 am Dr. Kathleen Kay, Assistant Professor, UC Santa Cruz—Origin and Diversification of the California Flora

The California Floristic Province exhibits one of the richest floras on the planet, with more than 5500 native plant species, approximately 40% of which are endemic. Despite its impressive diversity and the attention it has garnered from ecologists and evolutionary biologists, historical causes of species richness and endemism in California remain poorly understood. Using a phylogenetic analysis of 16 angiosperm clades, each containing California natives in addition to species found only outside California, we show that CA’s current biodiversity primarily results from low extinction rates, as opposed to elevated speciation or immigration rates. Speciation rates in California were lowest among Arcto-Tertiary lineages (i.e., those colonizing California from the north, during the Tertiary), but extinction rates were universally low across California native plants of all historical, geographic origins. In contrast to long-accepted ideas, we find that California diversification rates were generally unaffected by the onset of the Mediterranean climate. However, the Mediterranean climate coincided with immigration of many desert species, validating one previous hypothesis regarding origins of CA’s plant diversity. This study implicates topographic complexity and climatic buffering as key, long-standing features of CA’s landscape favoring plant species persistence and diversification, and highlights California as an important refuge under changing climates.

10:45-11:10 am Morning break

11:10-11:30 am Bart C. O’Brien, Director of Special Projects, Rancho Santa Ana Botanic Garden—Alternative Delineations of the California Floristic Province

Two mapped alternative hypothesis of the California Floristic Province (CFP) will be presented, compared, and contrasted. One data set covers the traditional CFP from southwestern Oregon through cismontane California to western Baja California, Mexico (Raven & Axelrod, 1978). The new data set removes much of comparatively wetter northern territory as well as the higher elevation areas of the Sierra Nevada (O’Brien et al. (RSABG), unpublished). Floristic data at the family, genus, and minimum-rank taxon levels will be presented and discussed for both alternatives. The endemic plants of the two alternatives will also be presented and discussed.

11:30 am-12:00 pm Naomi Fraga, Conservation Botanist, Rancho Santa Ana Botanic Garden—Monkeyflower diversity in California

The genus Mimulus L. (Phrymaceae) is widely known for its diversity in western North America. However, Mimulus s.l. has recently undergone a taxonomic revision resulting in significantly altered generic concepts. Two genera that have been resurrected: Erythranthe Spach and Diplacus Nutt., account for nearly all of the species diversity in western North American Phrymaceae. The genus Erythranthe (Phrymaceae) has recently been a source of floristic novelty, with eight new species described from California. Here I present a taxonomic overview of Phrymaceae, recognition of five new species of Erythranthe native to California and Nevada including description of their geographic distributions, habitats, pollination biology, and conservation status. An evaluation of species discovery and its implications for conservation will be presented, with insight from recent taxonomic studies in Erythranthe.

12:00-1:30 pm Lunch break

1:30-1:55 pm Nancy R. Morin, Flora of North America and Tina J. Ayers, Northern Arizona University—Natural History of Nemacladus

California Campanulaceae demonstrate many patterns of evolution and geographic distribution proposed in Raven and Axelrod’s seminal publication. The campanuloides are North Temperate in origin and came to California in three separate events, one path resulting in highly restricted species in mesic conditions, another in xeric adapted, often edaphically restricted, annual species. Campanuloides here exhibit changes in breeding system, from highly outcrossed to self-pollinated. The lobeloides most likely came via Mexico from South America, underwent an early radiation resulting in three highly restricted, monotypic genera and a later rapid radiation in Downinia; all are found in mesic or aquatic situations. Nemacladoidae is an ancient lineage not closely related to any other Campanulaceae. It may have originated from an ancestor in the mountains of central Mexico, where Pseudonemacladus occurs. Molecular analysis shows that there are two main clades in the annual Nemacladus, one strictly southern California/northern Baja California, the other ranging north in the Coast Ranges and Sierra Nevada and east and north into the Owen’s Valley, White Mountains, and Great Basin. Species differ in overall architecture as well as habitat and substrate, but the greatest diversity is in floral morphology. Flowers may be resupinate or not, highly zygomorphic or nearly actinomorphic, (relatively) large or tiny, strikingly marked or entirely white, with simple or elaborate hairs and nectar glands. Different genera or species of Campanulaceae, including Nemacladus, often co-occur in California. In Nemacladus, rapid diversification may have been made possible by shifts in floral morphology and pollinators, driving speciation.
Phacelia \((\text{Hydrophyllioideae: Boraginaceae})\) is a species well-represented and recognizable in the California flora. Commonly encountered and characteristic, a flowering phacelia is immediately diagnosable by amateur and professional botanists. The drawback to this familiarity is that people don't generally key, photograph, collect, or otherwise document plants they already know. \(\text{Phacelia sect. \text{Ramosissimae}}\) is an especially good example of that phenomenon; familiarity reinforces gestalt as a useful primary method to identify plants, but does not stimulate curiosity about special or distinguishing qualities (e.g., morphology, substrate, distribution). Plant names, some long treated as synonyms, represent testable hypotheses of evolutionary relationships in \(\text{Phacelia sect. \text{Ramosissimae}}\) and in the California flora in general. Molecular phylogenetic analyses are being used in combination with observational data, museum specimen collections, and the botanical literature to iteratively revise the taxonomy of \(\text{Phacelia sect. \text{Ramosissimae}}\). Metadata from herbaria accessions (annotations, georeferencing) and the literature (protologues, revisions, specimen citations) are being used to investigate spatiotemporal patterns of specimen collection, species discovery and description, and taxon sampling in molecular studies. Integrating observational data from archival sources (field notebooks, checklists, unpublished reports) and online, primary method to identify plants (e.g., photographs, occurrence reports) into the taxonomic revision is an important method to corroborate results from phylogenetic analyses. \(\text{Phacelia sect. \text{Ramosissimae}}\) demonstrates great value for species identification and (re)discovery of plants in California that share this "common" problem, illustrating key concepts of evolution and ecology in the flora, and highlighting connections between observations, fieldwork, museum collections, and molecular analyses in botanical systematics.

2:20-2:45 pm Genevieve Walden, PhD candidate, University of California, Berkeley—The problem of being common: integrating digital and observational data in a taxonomic revision of \(\text{Phacelia sect. \text{Ramosissimae}}\) (Hydrophyllioideae: Boraginaceae)

\(\text{Phacelia} \) (Hydrophyllioideae: Boraginaceae) is a well-represented and recognizable group in the California flora. Commonly encountered and

In 1978, D.I. Axelrod and I presented an analysis of the origins and evolution of the flora of California. The California flora represents a mixture of northern, temperate elements with xeric, southern ones, a composition that had been recognized for more than fifty years by that time. We explained the large number of species and high proportion of endemics in the State on the basis of (1) the equable climate that has prevailed in California throughout most of the Tertiary; (2) what we then thought was an elevation of the Sierra Nevada over several million years; and (3) the appearance of a cold offshore current that resulted in the development of a summer-dry climate over about two million years. Reason (1) accounts for the presence of many relict genera and some families, (3) for the many clusters of recently-derived species, as many careful analyses of individual groups have shown.

It now appears plausible that the mountains rose earlier than we thought, but both the antiquity of many lines and their diversification into large numbers of species, often annual, are as obvious to us now as they were 35 years ago. To try to drive these complex factors in a single, oversimplified hypothesis, as done for example by Lancaster and Kay, is both futile and misleading, when the explanations for the evolutionary patterns present in different groups are both highly diverse and intrinsically complex.