

## **Biology and Landscape**

Articles in this section display considerable change and expansion from the original twenty-minute presentations. The strength of this section is derived from the diversity of organisms considered with articles about pocket gophers, ducks, terrestrial and aquatic invertebrates, as well as spring and summer vernal pool plants. The articles also consider the history of vernal pool landscapes; the influence of climate patterns on pool formation; and the importance of soil in describing vernal pool patterns, controlling plant distribution, and impacting Mima mound formation in vernal pool mini-watersheds.

Sara Reed and Ronald Amundson apply recent advances in hillslope geomorphology to support the importance of pocket gophers in the origin and maintenance of Mima mounds. These mounds are important components of many vernal pool landscapes and undoubtedly influence watershed properties of individual pools. This work was conducted in the vernal pool landscapes adjacent to the newly developing University of California, Merced.

Robert Holland and Allan Hollander use environmental parameters associated with present-day vernal pool organisms to produce maps estimating the potential distribution of these pools before the Spanish occupation of California. Anyone familiar with attempts to project the loss of vernal pools by human development will recognize this as an expansion of the research initiated by Holland in the 1970s. The current article includes color maps illustrating probable loss of range for select vernal pool plants. An expansion of this information available on the Internet under California Fish and Game ([bios.dfg.ca.gov](http://bios.dfg.ca.gov)) can be either downloaded or used as an overlay on features such as topography, roads, streams, and counties (also available at the Bios website).

Robin Thorp provides an important review of research he and others have conducted for many years on native solitary bees that have life histories closely synchronized with the vernal pool flowers they pollinate. This paper shows the importance of preserving native landscapes surrounding the pools because they provide habitats used by these ground-nesting pollinators.

Robert Schlising provides plant censuses made in the dry vernal pool basins during the summer. The plants surveyed at Vina Plains Preserve are divided into: endemic vernal pool species, widespread wetland species, widespread exotic species, and widespread grassland species entering pools. Conspicuous changes in frequencies observed over 5 or 10 years are both illustrated and compared statistically. Representative pool maps illustrate distinct distributional patterns of select species, and changes in these patterns from year to year.

Douglas Alexander summarizes diverse observations on vernal pool macroinvertebrates made by him and his students over a period from the late 1960s to the mid 1990s. These research projects document the highly variable nature of vernal pool hydroperiods. A consideration of climate and local topography augments the description and understanding of vernal pools in the Vina Plains landscape. Observations made at different times are combined into accounts of life history characteristics of the resident aquatic macroinvertebrates.

Raymond J. Bogiatto and John D. Karnegis consider the use of vernal pools by diverse kinds of ducks at Vina plains. Field observations from flooding to drydown, combined with gut analyses, illustrate feeding activities in vernal pools. This important information has not been previously available. This article was published in July, 2006 in California Fish and Game, volume 92, pages 125-141.

