

# **Introduction**

## **California vernal pool landscapes defined**

A variety of vernal pools are found in California. These pools are formed mainly as a result of the mediterranean climate (hot, dry summers and cool, wet winters) interacting with diverse topography and soils. The well-known vernal pool landscapes found at the edge of the Central Valley (containing the Sacramento and San Joaquin Rivers) provide the main focus of this book.

Vernal pool landscapes display dramatically different responses to different stages in the mediterranean climate. Pools typically form above a water-resistant soil layer as a result of heavy rains. Individual pools have mini-watersheds that typically consist of thin-soil grasslands and flower fields that are dry and brown when there is little rain, and green and colorful when rain and temperature permit. Although the timing and quantity of rainfall are variable from year to year, larger pools typically retain water for several months before drying. Cool conditions, including some frost, are often associated with pool formation. Grazing by cattle, and activities by other vertebrates like pocket gophers, impact mini-watersheds and pool dynamics. These pools support numerous species of aquatic invertebrates, including fairy shrimp, tadpole shrimp and clam shrimp. Birds, especially large numbers of wintering waterfowl, move into the pools. In low rainfall years, vernal pools are discontinuous in space and time, and dry early; in high rainfall years, larger pools may retain surface water into the summer. Vernal pool landscapes include shallow drainages, as well as small and large pools which display flowers such as meadowfoams, goldfields and downingias during spring drydown. Some native pollinators of these vernal plants resist the dry summer in brood cells within adjacent grassland soils. In the late spring and early summer, some drying pool basins are green islands in brown grasslands. In the summer, larger pool basins support plants such as orcutt grasses.

The vernal pool landscape is characterized by plants and animals active during restricted seasons in local concentrations that potentially vary from year to year. The resident species survive because they also have adaptations (e.g., resistant propagules) to bridge seasons (or years) unfavorable to their growth and reproduction.

## **Loss of vernal pool landscapes**

Demand for level ground by humans has compromised many of these landscapes. Vernal pool landscapes have often been replaced by intensive crop agriculture and urban expansion. Currently, fragmented remains of these landscapes are preserved and used for seasonal grazing. These remaining vernal pool landscapes, and the plants and animals found in them, are the primary focus of this book.

## **Concerns about vernal pool losses**

Barbara Vlamis, Executive Director of Chico's Butte Environmental Council, chaired a committee to consider the conservation of vernal pool landscapes. This committee convened a two-day conference on the biology, conservation and management of vernal pools in March 2006. Over 200 people assembled on the first day of this conference in the Big Room of the Sierra Nevada Brewery in Chico. Talks were given by researchers, government regulators, individuals that own and manage vernal pool landscapes, and others interested in preserving these areas. The keynote speech was followed by talks divided into sections on biology, conservation and management of vernal pool landscapes. On the second day, participants visited three vernal pool landscapes: Bidwell Ranch, a vernal pool preserve purchased by the City of Chico and being developed as a mitigation bank; Stone Ranch Preserve, a newly established preserve managed by California Fish and Game; and Vina Plains Preserve, operated by The California Nature Conservancy.

### **The Development of this Book**

The success of the conference encouraged Rob Schlising and Doug Alexander to edit and assemble a book developed from the presentations. Speakers were given an opportunity to provide either a summary of their talk or an expanded manuscript. All but one of the speakers contributed. Although some articles were expanded considerably beyond the 20-minute oral presentation, others were derived directly from their talks. We thank Maggi Barry of Butte Environmental Council for transcribing several of the talks. We are grateful to the authors for the effort they put into developing their papers. A strength of this book is derived from the diversity of these contributions.

The following individuals provided critically important peer-review comments, including suggested changes that improved the quality of papers: Doug Alexander, Kathy Alexander, Craig Aubrey, Jennifer Buck, Barbara Castro, John Eads, Sean Gallagher, Cay Goude, Tom Griggs, Christine Hantelman, M. E. Heitmeyer, Bob Holland, Megan Keever, Jenny Marr, Chris Nagano, Chuck Nelson, Jim Nelson, Rob Preston, Ryan Runquist, Rob Schlising, David Schmidt, Joe Silveira, Rickelle Syrdahl, Barbara Vlamis, John Vollmar, Caroline Warren, Bill Wilson, and Mike Wolder.

This book is the 14<sup>th</sup> publication in the series Studies from the Herbarium, Department of Biological Sciences, California State University, Chico. We thank Tricia Edelmann and Ailsie McEnteggart, past Chair and current Chair of the Department, for providing office space to prepare this book, and for financing the cover. We also thank Chris Ficken, Communication Design Department, for the cover design. Special thanks go to the exemplary effort of Lawrence Janeway, longtime coordinator of the Studies from the Herbarium, who became a champion of quality control in the final production of this book. However, the book editors accept responsibility for potential editorial errors.

### **Sequence of articles in the book**

The initial article, by Jennifer Buck and others, is an expansion of ideas presented by Michael Barbour in the keynote presentation. The study includes tests of the stability of vernal pool plant communities to support a classification of these communities by a UC Davis team, led by Barbour. This study also suggests that vernal pool vegetation assembles in created pools. Two of the multiple authors of this study also contributed individual articles in this book.

The rest of this book is divided into the three sections that were used during the conference: Biology and Landscape, introduced on page 13; Conservation, introduced on page 119; and Management, introduced on page 161. The book ends with closing comments by Barbara Vlamis of BEC.

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