

Landscape Ecology

Ecological restoration projects in Southern California often focus on small areas. But concentrating only on isolated, dispersed pieces of land can contribute to the fragmentation of our regional ecosystem. In the past decade or so, a new discipline known as landscape ecology has emerged to offer us ways to look at our area on a much broader scale.

Landscape ecology---the ecology of landscapes, regions, or other large heterogeneous areas---is the study of how landscape patterns influence the processes that determine the abundance and distribution of plants and animals. The spatial pattern or structure of a landscape is a mosaic made up of three universal elements: patch, corridor and matrix. The composition and configuration of those habitat elements in turn control the movement of animals, plants, water, soil, and energy through that landscape. Studying those elements also provides a basis for comparing dissimilar landscapes and for developing general concepts about how landscapes operate over space and time.

Many of the following materials offer an excellent introduction to the field of landscape ecology, as well as tools to integrate landscape ecology into restoration and conservation planning for coastal Southern California.

- ***Links to online documents***

California Gap Analysis. About 15 years ago, the US Geological Survey developed a methodology, called Gap Analysis, to identify the distribution of plant and animal species over large spatial areas. Gap Analysis is based on the premise that a species-by-species approach to conservation is not effective because it does not address the continual loss and fragmentation of natural landscapes and that native vertebrate populations can be protected only if we protect regions that contain large areas of their habitat. The approach uses GIS maps of vegetation and habitat types to locate areas of species diversity that are poorly represented on conservation reserves or other areas managed for biodiversity protection. By identifying such "gaps" in the protection of native animal species and plant communities, Gap Analysis can suggest priority areas for conservation, ones that can be studied in more detail as candidates for acquisition or protection. Because of the state's size and complexity, the California Gap Analysis was conducted on a regional basis, using the ten major regions of the state defined in *The Jepson Manual of Higher Plants of California* (J. C. Hickman, editor; University of California Press, 1993). A copy of the California Gap Analysis report can be downloaded from UCSB Biogeography Lab's website: http://www.biogeog.ucsb.edu/projects/gap/gap_rep.html

California Legacy Project. An program of the State Resources Agency, known as the California Legacy Project, is in the process of creating a suite of tools and maps to assist decision-makers in developing strategies for conserving California's natural resources. Among those tools is the ***California Digital Conservation Atlas***, a publicly-available web resource that has been designed to provide easy-to-use, map views of California's natural resources and working landscapes for people who may not be familiar with specialized geographic software. The Atlas integrates a range of data sets about California's landscapes. Users can create maps containing layers of different information, using such data areas as natural vegetation, fire history, wetlands, important farmlands, soils, public ownership, urban areas and projected growth, rivers, lakes, dams, roads, floodplains, watersheds, and USGS topographic maps. The site (which contains instructions on its use) allows people to identify locations of particular natural resources, compare areas with different natural resource values, and look at how conservation or restoration efforts can be linked in the context of surrounding lands. Documents relating to the Legacy Project, as well as links to the California Digital Conservation Atlas are available on the project's website: <http://legacy.ca.gov/>

- **Annotated bibliography**

Atlas of the Biodiversity of California (California Department of Fish & Game, Sacramento, CA, 2002, \$20.00, with order information at <http://atlas.dfg.ca.gov>) provides an excellent introduction to the state's rich diversity of plant and animal species. Illustrated with 87 nature photographs, 48 full-color maps, and 10 wildlife illustrations (and including an extensive bibliography and glossary), the *Atlas* explains what biodiversity actually is and how it is measured. Its maps superimpose layers of GIS information to create maps that illustrate the richness and rarity of the state's flora and fauna; each map is accompanied by an article to explain the information on the graphic. The *Atlas* also discusses the state's geography and answers such questions as what plants and animals occur in California, why they have been lost or become threatened, and what preservation and restoration strategies are underway to protect the state's biodiversity.

Bissonette, John A, and Ilse Storch, editors. **Landscape Ecology and Resource Management: Linking Theory with Practice** (Island Press, Washington DC, 2002). The articles collected in this volume seek to bridge the gap between the science of landscape ecology and on-the-ground land and resource management, relating theory and empirical research to the practical needs of resource managers. Chapters discuss examples of interactions between people and nature in various parts of the world and focus on such issues as landscape theory and population dynamics, conservation and the indicator species concept, and application of the concept of "fitness landscapes" to the behavior and distribution of animals.

Dramstad, Wenche E., James D. Olson, and Richard T. T. Forman. **Landscape Ecology Principles in Landscape Architecture and Land-Use Planning** (Island Press, Washington DC, 1996). This book provides a simple, concise primer on the key principles of landscape ecology and is an excellent introduction to the subject. Clearly written and illustrated, it offers a series of case studies that allow the reader to visualize how those principles can be applied in specific situations to designing, planning and solving land-use issues across a range of scales and landscapes. Sections cover patches (size, number, and location), edges and boundaries, corridors and connectivity, and landscape mosaics.

Forman, Richard T. T. **Land Mosaics: The Ecology of Landscapes and Regions** (Cambridge University Press, New York, 1995). This is an excellent text for anyone interested in landscape ecology. Following an introductory chapter on mosaics and the patch-corridor-matrix model, the author explores the array of patch, corridor, and matrix types, plus movements and flows between adjacent elements and resulting mosaics. Later chapters discuss the impacts of land transformation and fragmentation, as well as options for planning and managing landscapes or regions.

Groves, Craig R. **Drafting a Conservation Blueprint: A Practitioner's Guide to Planning for Biodiversity** (Island Press, Washington DC, 2003). This book offers a step-by-step planning process for conserving the biological diversity of entire regions, explaining how to develop a regional conservation plan, and offering guidance that synthesizes disparate information about ecology, conservation biology, planning, and policy. Chapters include discussions of such topics as developing a planning framework, selecting conservation targets and setting goals, assessing population viability and ecological integrity, selecting and designing a portfolio of conservation areas, and assessing threats and setting priorities. It is a useful handbook for people involved in landscape-scale or regional conservation planning.

Gutzwiller, Kevin J, and Annabelle J. McIver. **Applying Landscape Ecology in Biological Conservation** (Springer Verlag, New York, 2002). This book discusses principles for applying landscape ecology to biodiversity conservation and describes examples of their use in management, research and planning.

Liu, Jianguo, and William W. Taylor, editors. ***Integrating Landscape Ecology into Natural Resource Management*** (Cambridge University Press, New York, 2002). Includes 20 articles that explore how resource management and landscape ecology can inform each other in approaches to common problems of theory and practice. The book's major themes include landscape structure and multi-scale management, landscape function and cross-boundary management, and landscape change and adaptive management. It includes case studies and critical reviews of management practices, as well as guidelines for managing natural resources from a landscape perspective.

Turner, Monica, R.H. Gardner, and R.V. O'Neill. ***Landscape Ecology in Theory and Practice: Pattern and Process*** (Springer Verlag, New York, 2001). This text--written by several prominent researchers for ecologists, land managers and students in landscape ecology--provides an excellent introduction to the professional literature on most topics of landscape ecology, synthesizing recent material on such issues as scale, landscape metrics and disturbance. The book comes with a companion CD-ROM.