



Lake Tahoe Watershed Assessment

Volume II

**United States Department of Agriculture
Forest Service**

March 2000



The United States Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD). To file a complaint of discrimination, write:

USDA, Director
Office of Civil Rights
Room 326-W, Whitten Building
14th and Independence Avenue, SW
Washington, DC 20250-9410

Or call: (202) 720-2600 (voice or TDD). USDA is an equal opportunity provider and employer.

Abstract:

Murphy, Dennis D.; Knopp, Christopher M., technical editors. 2000. **Lake Tahoe Watershed Assessment: Volume II.** Gen. Tech. Rep. PSW-GTR-175. Albany, CA: Pacific Southwest Research Station, Forest Service, US Department of Agriculture; 753 p.

The Lake Tahoe Basin has been the subject of decades of research and monitoring efforts. However, the Lake Tahoe Watershed Assessment is the first attempt to collate, synthesize, and interpret available scientific information with a comprehensive view toward management and policy outcomes. The seven-chapter assessment presents new and existing information in subject areas pertinent to policy development and land and resource management in the basin, including environmental history, air quality, watershed dynamics and water quality, biological integrity, and socioeconomic conditions.

Volume II is supporting documentation for several of the discussions in Volume I. Its appendices offer more detailed information regarding vascular and nonvascular plant, vertebrate, and invertebrate species, fungi, and a range of conservation applications for each. The appendices also discuss modeling assumptions and a partial list of important monitoring considerations for several resources areas.

Retrieval Terms: environmental history, air quality, water quality, biotic integrity, socioeconomics, adaptive management, California, Nevada

Technical Editors:

Dennis D. Murphy is a Research Professor of Biology, University of Nevada, Reno, NV 89557 (E-mail: ddmurphy@biodiversity.unr.edu).

Christopher M. Knopp is Staff Director for Natural Resources, Lake Tahoe Basin Management Unit, USDA Forest Service, 870 Emerald Bay Road, South Lake Tahoe, CA 96150 (E-mail: cknopp@fs.fed.us).

Publisher:

This report on the "Lake Tahoe Watershed Assessment," issued in two volumes (Volume II consists of appendices), was published by the Pacific Southwest Research Station, USDA Forest Service, in cooperation with the Pacific Southwest Region of the USDA Forest Service, Tahoe Regional Planning Agency, University of California at Davis, University of Nevada at Reno, and the Desert Research Institute, Reno, Nevada.

The Lake Tahoe Watershed Assessment Volume II

Edited by

Dennis D. Murphy
and
Christopher M. Knopp

March 2000

In collaboration with USDA-Pacific Southwest Region and Research Station, the Tahoe Regional Planning Agency, the University of California at Davis, the University of Nevada at Reno, and the Desert Research Institute, Reno, Nevada.

Lake Tahoe Watershed Assessment: Volume II

Technical Editors: Dennis D. Murphy, Christopher M. Knopp

Acknowledgments

In the summer of 1997, at the request of the local community and with the invaluable assistance of United States Senator Harry Reid, President Bill Clinton and Vice President Al Gore visited the Lake Tahoe basin to discuss issues surrounding its decline in environmental quality. As a result of that visit, funding was provided by the USDA Forest Service to complete this comprehensive report on a watershed assessment of Lake Tahoe and its subsequent publication.

Mike Dombeck, Chief, USDA Forest Service, G. Lynn Sprague, former Regional Forester, and Brad Powell, current Regional Forester, Pacific Southwest Region, USDA Forest Service, provided the institutional and financial support necessary to conduct this assessment.

The Lake Tahoe Watershed Assessment Team expresses its appreciation to the following individuals for their hard work in developing and refining portions of this report: Mark D. Palmer, Patricia Arneson, Patricia Bucknell, Mauri Janik, Robert Leonard, Earl R. Byron, George J. Malyj, Richard Axler, Robert N. Coats, M. Levant Kavvas, Geoffrey Schladow, Neil Sugihara, John Battles, John Maher, Dana Supernowicz, Alan Wallace, Sarah Michehl, Todd Caldwell, Rick Susfalk, Tinker McSwain, Lisa Cullen, Peter Hartsough, Anya Butt, Alan Gertler, Jim Allison, Trent Procter, Chris Adair, Kevin Hill, Brant Allen, Lori Allesio, Robin Barron, Larry Benoit, Aaron Bilyeu, Stephanie Byers, Allen Cooperrider, Almo Cordone, Ann Dennis, Dennis Desjardin, Jason Dunham, George Elliott, Nancy Erman, Maurya Falkner, Gabe Garcia, Bob Hall, David Hatfield, Sherry Hazelhurst, Daniel Hintz, Mollie Hurt, Victor Inera, Richard Kattlemann, John Keane, Rod Kerr, Lynn Kimsey, Kevin Laves, Dennis Lee, Karen Leyse, Peter Maholland, Michelle McKenzie, Peter Moyle, Josh Murphy, Joanne Nevers, Larry Neel, Lisa O'Daly, Dorrie Panayotou, Mary Peacock, Sanjay Pyare, Matthew Rahn, Michael Reed, Jeff Reiner, Dave Roberts, Rick Robinson, Dirk Rodriguez, Colleen Shade, Jim Shevock, Steve Shoenig, Donald Storm, Paul Stover, Debra Tatman, Mike Taylor, Susan Urie, Kathy Van Zuuk, Garrett Villanueva, Mark Vinson, Gary Walter, Jeff Waters, German Whitley, Karen Willet, Brian Woodbridge, Mary Ward, Mitch Riddle, Brad Shaffer, Yiqi Luo, Shi kui Xue, Bernie Bahro, Mark Finney, and Bill Zelinski.

We also thank the following organizations for their support, guidance and assistance: the Lake Tahoe Federal Advisory Committee, the Watershed Assessment Executive Oversight Committee, the Lake Tahoe Transportation and Water Quality Coalition, the California Tahoe Conservancy, the Nevada State Division of Lands, and the Washoe Tribe of Nevada and California.

Several consultants contributed to the development of this document: Tetra Tech, Inc., particularly Randy Varney and Cindy Schad, who provided the technical editing and layout; Joan Wright, who assisted the editorial process; Nick Dennis from Jones and Stokes, who contributed to the socioeconomic assessment; Kelly Berger and Steve Holl, also of Jones and Stokes, who performed some of the fire behavior modeling; and Johnathon Kussel, who assisted with early scoping meetings.

Several individuals made outstanding contributions: Sue Norman performed admirably in a variety of difficult roles, but perhaps none is appreciated more than her role in keeping our books and contracts up to date. Jim Baetge provided constructive criticism and guidance through an often difficult process; and Juan Palma gave valuable support.

The contents of this publication are in the public domain, except for the photographs on the cover and chapter divisions, which were provided by John T. Ravizé and Linda Ravizé, Institute of Mountain Photography, P. O. Box 444, Zephyr Cove, NV 89448.

The Watershed Assessment Team

Michael G. Barbour is Professor of Plant Ecology, University of California, Davis, CA 95616 (E-mail: mgsbarbour@ucdavis.edu). Co-author, Chapter 5.

Thomas A. Cahill is Professor of Atmospheric Sciences and Physics, University of California, Davis, CA 95616 (E-mail: tacahill@ucdavis.edu). Co-author, Chapter 3.

Steven S. Cliff is a post-doctoral researcher, Delta Air Quality Group, University of California, Davis, CA 95616 (E-mail: sscliff@ucdavis.edu). Primary author, Chapter 3.

Jo Ann A. Fites-Kaufman is an Ecologist, Tahoe National Forest, USDA Forest Service, P.O. Box 6003, Nevada City, CA 95959 (E-mail: jfites@fs.fed.us). Co-author, Chapter 5.

Carl Hasty is Environmental Improvement Program Coordinator Tahoe Regional Planning Agency, P.O. Box 1038, Zephyr Cove, NV 89448, and served as project co-manager of the Lake Tahoe Watershed Assessment (E-mail: chasty@trpa.org).

Christopher M. Knopp is Staff Director for Natural Resources, Lake Tahoe Basin Management Unit, USDA Forest Service, 870 Emerald Bay, South Lake Tahoe, CA 96150, and served as the project co-manager of the Lake Tahoe Watershed Assessment (E-mail: cknopp@fs.fed.us). Co-author, Chapter 7.

Susan Lindström is a consulting archaeologist, P.O. Box 3324, Truckee, CA 96160 (E-mail: slindstrom@jps.net). Author, Chapter 2.

Patricia N. Manley is Regional Wildlife Ecologist, Pacific Southwest Region, USDA Forest Service, 870 Emerald Bay Road, South Lake Tahoe, CA 96150 (E-mail: pmanley@fs.fed.us), Primary author, Chapters 5, 7.

Wally W. Miller is Professor of Soils and Hydrology, University of Nevada, Reno NV 89557 (E-mail: wilymalr@ers.unr.edu). Co-author, Chapter 4.

Dennis D. Murphy is Research Professor of Biology, University of Nevada, Reno, NV 89557 and served as Science Team Leader, Lake Tahoe Watershed Assessment Team (E-mail: ddmurphy@biodiversity.unr.edu). Primary author, Chapter 1; co-author, Chapter 7.

Mark Nechodom is a Research Social Scientist, Pacific Southwest Research Station, USDA Forest Service, 801 I Street, Sacramento, CA 95814 (E-mail: manechodom@ucdavis.edu). Primary author, Chapter 6; co-author, Chapter 7.

John E. Reuter is Director, Lake Tahoe Interagency Monitoring Program, University of California, Davis, CA 95616 (E-mail: jereuter@ucdavis.edu). Primary author, Chapter 4.

Rowan Rowntree was, until his retirement, Senior Scientist, Northeastern Research Station, USDA Forest Service, 11 Campus Blvd., Suite 200, Newtown Square, PA 19073 (E-mail: rowntree@fs.fed.us). Co-author, Chapter 6.

John C. Tracy is Associate Professor of Hydrologic Sciences, Desert Research Institute, University of Nevada, Reno, NV 89512 (E-mail: jtracy@dri.edu). Co-author, Chapter 7.