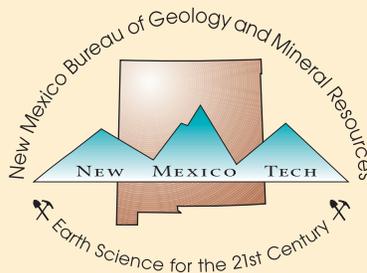


WATER, NATURAL RESOURCES, AND THE URBAN LANDSCAPE

The Albuquerque Region

L. Greer Price, Douglas Bland,
Peggy S. Johnson, and Sean D. Connell, Editors



New Mexico Bureau of Geology and Mineral Resources
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Water, Natural Resources, and the Urban Landscape

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CONTENTS

Preface. . . **vii**

An Introduction from the State Geologist—*Peter A. Scholle*. . . **1**

CHAPTER ONE THE PHYSICAL AND HISTORICAL FRAMEWORK

Resource Issues and Urban Development in the Albuquerque Region –
V. B. Price. . . **7**

Geology and Landscape in the Albuquerque Area –
Sean D. Connell and Dave Love. . . **10**

The Geology and Hydrology of the Albuquerque Area—How We Know
What We Know – *Peggy S. Johnson*. . . **18**

Surface Water/Ground Water Connections – *Dianna M. Crilley*. . . **25**

Water Resources Management in the Albuquerque Urban Watershed –
Mark T. Murphy and J. Steven Glass. . . **32**

CHAPTER TWO WATER: A LIMITING FACTOR

Water Supply Limitations in the Albuquerque Area –
Deborah L. Hathaway. . . **41**

The Impact of the City of Albuquerque's San Juan–Chama Drinking
Water Project on New Mexico's Rio Grande Compact Obligations –
Kevin Flanigan and Amy Haas. . . **45**

Water Quality in the Albuquerque Area – *Marcy Leavitt*. . . **50**

Deep Nonpotable Aquifers: The Exceptions to the Rules –
Michael S. Johnson, Peggy Barroll, and Douglas H. Rappuhn. . . **57**

Water Conservation in the City of Albuquerque:
Are We Doing It Effectively? – *Jean Witherspoon*. . . **63**

Urban Water Administration in the Albuquerque Urban Area –
Susan Kelly. . . **68**

CHAPTER THREE GEOLOGIC ISSUES ASSOCIATED WITH URBAN GROWTH

Mineral Resources and Urban Growth in the Albuquerque Region –
Douglas Bland. . . **75**

Oil and Natural Gas Potential of the Albuquerque Basin –
Ron Broadhead. . . **80**

Geologic Hazards in the Albuquerque Area – *Dave Love and
Sean D. Connell*. . . **87**

Flood Control Challenges in Bernalillo County – *John P. Kelly and
Fritz Blake*. . . **95**

Habitat Restoration and a Conservation Strategy for the Rio Grande
Silvery Minnow – *C. Nicolas Medley*. . . **102**

CHAPTER FOUR

A LOOK TO THE FUTURE

- Water Supply Strategies Identified in New Mexico Water Plans –
Joanne Hilton and Dominique Cartron. . . 111
- The Middle Rio Grande Water Right Market – *Kyle S. Harwood. . . 117*
- Saline Water—Considerations for Future Supply in New Mexico –
Bruce Thomson and Kerry Howe. . . 120
- The Energy/Water Connection and the Future of Energy in New Mexico –
Peter A. Scholle. . . 127
- Is Ground Water Really a Resource in the Albuquerque–Belen Basin? –
John Shomaker. . . 132
- Urban Planning in an Era of Diminished Resources – *Phyllis Taylor. . . 137*
- List of Contributors. . . **144**
- Photo Credits. . . **150**
- Acronyms. . . **151**
- Generalized Geologic Map of the Albuquerque Region – **Inside back cover**
- Drainage Facilities in the Albuquerque Metropolitan Area – **Plate**

Preface

In 2001 the New Mexico Bureau of Geology and Mineral Resources initiated a series of field conferences designed to provide legislators and other decision-makers with the most reliable and up-to-date information on geologic and resource issues affecting New Mexicans. We felt there was a genuine need for this kind of hands-on, field-oriented educational experience, aimed at providing a sound scientific basis for policy decisions that affect us all. We felt, too, that we were the ideal people to undertake it. As a non-regulatory, research and service division of New Mexico Tech, we've served as the state geological survey for New Mexico since 1927; gathering this kind of information and providing it to the public is what we do.

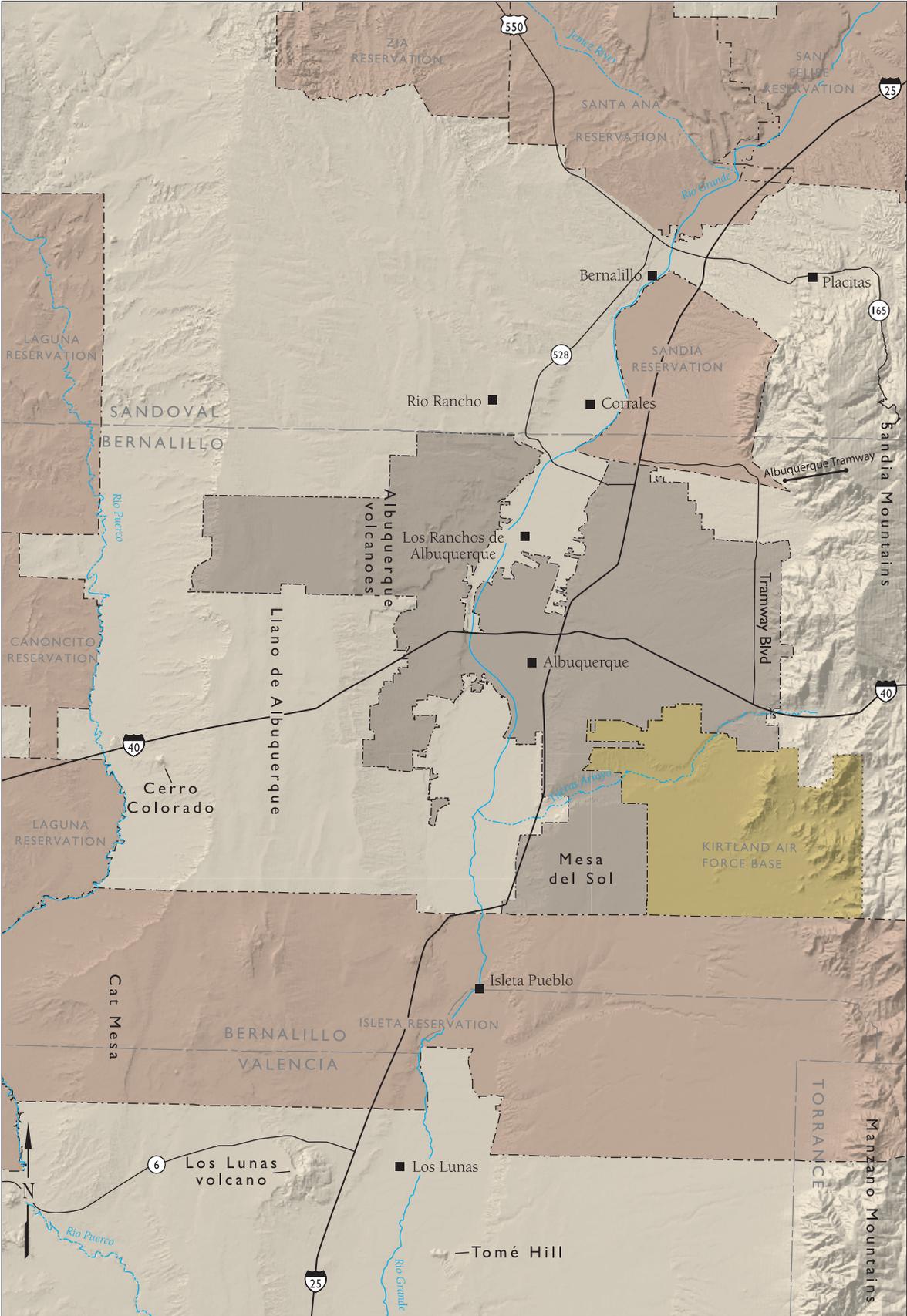
In the eight years since then, we've run five such conferences, each focusing on a specific area of the state and a particular set of issues. In conjunction with each of these conferences, we've produced a single-volume anthology of articles to provide background material that serves not only field-trip participants but the broad spectrum of readers who we felt would welcome this material, written and edited in a format that would provide, in plain English, updates on some of the most important resource issues facing our state.

This sixth volume, produced in conjunction with our spring 2009 conference, focuses on resource issues related to urban growth and development in the greater Albuquerque region. The need for this kind of information is more pressing now than it ever has been. The downturn in our global economy, the fluctuating costs of energy resources, the ongoing growth of our urban areas, and a growing scarcity of resources are just some of the things that will require us to re-examine how we do things. We've tried to provide a balanced view rather than a comprehensive one, but we've addressed a broad spectrum of related issues that are critical to the future of the state's largest urban area. As always, there's a strong focus on water, but we've also addressed geologic hazards, flood control challenges, the future of saline waters and nonpotable aquifers, oil and natural gas potential of the Albuquerque Basin, the challenges of urban planning in an era of diminished resources, and the ultimate goal of sustainability of these resources.

We worked hard to find authors who could speak with both authority and clarity. We gratefully acknowledge the hard work of all of these authors

in working with us to bring this information to the public eye. We've asked them to rely on fact rather than opinion, but the papers invariably reflect to some degree the opinions of the authors. Their views do not necessarily represent the voice of the New Mexico Bureau of Geology and Mineral Resources or their partner agencies, but they do represent the voice of experience and expertise. These people, and others like them who are working to help policy makers make informed decisions, are collectively one of the most important resources we have.

Albuquerque's future is closely tied to natural resources, and effective and forward-looking management of these resources is critical to ensuring their availability into the future. The framework in which resource management takes place is rapidly changing. As we go to press the governor has just signed a controversial new law that gives the state engineer jurisdiction to regulate deep saline aquifers. For the first time, scientific and legal considerations will be used to determine whether and how development of these aquifers is allowed. Often far-reaching policy decisions are made based on incomplete or inappropriate information. The articles in this volume do not necessarily provide the answers to these perplexing issues, but rather help to frame them with scientific and public policy information so we can ask the right questions. Only then can we hope to enhance the economic, social, and environmental well-being of our citizens.



An Introduction from the State Geologist

Peter A. Scholle, *New Mexico Bureau of Geology and Mineral Resources*

Welcome to the sixth decision-maker field conference. These conferences, and the volumes we produce in association with them, are designed to provide New Mexico decision makers with the opportunity to see first hand the influences and impacts of natural phenomena and human actions on our resources and landscapes. This year's meeting, on urban geologic issues in the Albuquerque region, highlights some important and contentious issues for the future of that city and many other areas of New Mexico. It is designed, in large part, to raise the awareness of geologic and hydrologic issues that affect urban development and human safety.

Many such issues are involved, and they can generally be grouped in three areas: developmental, hazard-related, and environmental. Developmental issues are ones that affect the feasibility or affordability of urban growth, such as the availability of nearby supplies of sand and gravel for foundations and roadbeds, accessible limestone or gypsum deposits to produce Portland cement and wallboard, availability of potable water supplies, and magnitude and cost of accessible energy resources. Geologic hazards issues include volcanic eruptions, floods, earthquakes, landslides, rockfalls, and collapsible or expansive soils that can endanger both urban infrastructure and human life. Environmental issues include the protection of the natural conditions of the regions and mitigation of natural conditions that affect human health. Environmental issues cover an enormous gamut of topics. Some examples are: how to site a landfill so as to avoid contamination of ground waters, how to find alternative water supplies in areas with arsenic-bearing waters, or how to predict areas with likely radon issues in homes.

This trip will not touch on every one of these issues, but it will discuss the science behind many of them. But I would like to step away from the science for a moment and mention some of the policy aspects of these issues. What they all have in common is that they require long-range planning and, in some cases, extremely long-range planning, if they are to be dealt with effectively. In the resource sector, government agencies should try to anticipate long-term demands for locally supplied resources such as sand and gravel, cement, or water. We can assure that these resources are available in the future by protecting the limited geologic areas in which they are found from development. In the hazards area, even longer-range planning

is needed because of the time scales on which such events occur. Substantial floods may recur on time scales of decades or centuries; earthquakes and volcanic eruptions typically recur at intervals of centuries to millennia. Although these time periods are long enough to cause some to question the need for substantial planning, the scale of damage from such events can be so catastrophic that adequate preparation is indeed essential to prevent major loss of life and property. Finally, environmental events of a geologic nature, such as large-scale water pollution, also can be slow to form and may take decades to detect or to impact humans. There, too, continual monitoring and prevention or remediation are important in constraining damage to humans and the ecosystem.

In evaluating how to plan for all these situations we commonly think very locally and that can be quite literally "short sighted." We are no longer in a world where communities and their problems are isolated from one another. As the title of Thomas Friedman's recent book indicates, the world is becoming "hot, flat, and crowded," and all three of those terms are relevant here. "Hot" refers to the now virtually incontrovertible fact that global climates are changing and that human activities are playing a major role in that change. "Flat" refers to the fact that many countries, especially in Europe, Asia, and South America, have reached American standards of living and are competing with us on an equal footing for jobs and resources. And "crowded" refers to the staggering growth in world population, a growth that has led to a three-fold increase in the number of humans on Earth just in my lifetime (about 2.3 billion in 1944 to today's estimated 6.8 billion). At current rates of growth, we will have more than 9 billion people by 2050.

How do these three factors affect our views of issues discussed on this trip? Well, in many different ways, in each of the three sectors discussed earlier. In resources, we are in a global competition for increasingly scarce materials driven by both soaring population and increasing global industrial development and affluence. Energy, water, metals, and most other internationally traded commodities showed sharp increases in demand (and corresponding price increases where supply could not keep up with demand) during the decade before the current economic downturn. Once global economies recover, those competitive price pressures will return. Cities that plan well to maximize their self

sufficiency in supplying energy, water, and other vital materials will thrive; those that do not will not, and may even decline.

In the hazards area, we are becoming increasingly aware that climate change includes shifts to more extreme weather events including flash floods with associated mudflows and rockslides, stronger and more frequent hurricanes and tornadoes, and more extensive and intensive droughts. Although these may appear at first to contradict each other, it is quite possible to have rainfall concentrated in fewer events, leading to more extended droughts interspersed with severe rainfall events that cause damaging floods. Given these predicted changes, long-term planning should not rely just on records of recent past history but should anticipate likely future conditions. What are now considered hundred-year floods may become decadal or even annual events as climate changes and as urbanization increases. To clarify the role of urbanization in that prediction, it has been shown that development affects the speed of runoff because storm drains, along with concrete-lined floodways and streets, deliver water to rivers far faster than normal runoff and infiltration from fields and forests—and that makes heavy rain events even more likely to produce flash flooding.

Finally, in the environmental area, increasing population, increasing development, and climate change will all add to the stresses on natural ecosystems. In the geologic and hydrologic areas, these factors will make it more difficult to maintain good water quality because of ever-increasing non-point sources of pollutants, more difficult to control soil erosion and farmland degradation, and more difficult to minimize airborne transport of pollutants.

So with all this gloom, are we facing doom? I don't think so. If we have the will to do what environmentalists have urged for decades—act locally but think globally—we can control the slide toward future crises. We can aid and encourage global population control if we have the will to do so. We can change our energy use patterns to ones that are more sustainable, if we have the desire to do so. We can help developing countries to avoid following our path to wealth by sharing new, non-polluting, sustainable technologies, if we have the wisdom to do so. And most of all, we can set positive examples at the local level, in Albuquerque and other New Mexico communities. We can pioneer cities run predominantly off renewable or sustainable energy—solar, wind, geothermal, algal biomass, and nuclear (with twenty-first century technology, nuclear energy is now virtually sustainable). We can build far more energy-efficient homes, offices, and transporta-

tion systems. We can emulate other communities that already recycle most of the products and materials they use. We can do far more to reduce consumptive use of water. We can pioneer ways of reducing evaporative water losses. We can put our heads together and come up with a thousand more things to do to affect the trajectory of future change, and then we can conjure up the will to do them.

In his book *Hot, Flat, and Crowded* Thomas Friedman quotes the founder of Common Cause, John Gardiner, as saying that these global issues are just “a series of opportunities disguised as insoluble problems.” If you think about that for a moment, I think you will recognize considerable truth in that statement. If we put our shoulders to the wheel and develop the strategies and technologies to overcome the clearly foreseeable crises of the future, we will be in a great position to lead the world, both economically and morally. Even cities can lead in that process by putting their development incentives into attracting such innovative companies. Cities like Albuquerque can lead in the implementation of those solutions. And if this conference increases awareness and planning in New Mexico for innovation in the use of energy, water, and other natural resources, then it will have truly been a success.

Suggested Reading

Hot, Flat, and Crowded, Thomas Friedman, Farrar, Straus and Giroux, 2008.

