

# Chapter 1





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## The United States–Mexican Border— A Land of Conflict and Opportunity

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*The boundary between the United States and Mexico was created for convenient expediency through political debate and agreements (fig. 1–1). With the exception of the eastern segment of the border, which follows the course of the Rio Grande (known as the Rio Bravo in Mexico), the defining of this border was based on political decisions that had little concern for ecosystems, geologic features, or water—all of which span that imaginary line. However, the location of the border has had a remarkable effect on the biologic and physical systems in the border region and, in turn, has had a growing influence on what we now see as 21st century socioeconomic and environmental priorities. Because of the complex interactions of the human, ecological, political, and economic exigencies associated with this area, the status of the United States–Mexican border region, known as the Borderlands,<sup>1</sup> has become an ever-present concern for most American citizens and for Mexican and United States Federal, State, and local governments.*

<sup>1</sup> A note on the terminology in this report—The United States–Mexican border region is alternatively referred to as the Borderlands; the term Borderlands has become an accepted name for this region and conveys the appropriate degree of inclusiveness for this binational area. Also, because this is a publication of the U.S. Geological Survey, American names for features will be used, in accordance with the National Geospatial-Intelligence Agency GeoNames database and the USGS Geographic Names Information System. For example, the river forming the eastern portion of the border will be referred to as the Rio Grande, though it is known as the Rio Bravo in Mexico, and the body of water between Baja California and Sonora will be referred to as the Gulf of California, also known as the Sea of Cortez.



# border region



Base from U.S. Geological Survey  
GTOPO30 (Global 30 Arc Second Elevation Data)

0 50 100 150 200 MILES  
0 50 100 150 200 KILOMETERS

## EXPLANATION

- Watershed area—(Woodward and Durall, 1996)
- International boundary
- Boundary of 1983 La Paz Agreement—100 kilometers from international boundary

**Figure 1–1.** The immediate area in both countries adjacent to the United States–Mexican border, known as the Borderlands, has no one set of defining boundaries. For example, the boundaries of the 1983 La Paz Agreement are most appropriate in political contexts, but watershed boundaries are more applicable to discussions of hydrologic issues. For this report, the subareas used to define the Borderlands (see chapter 2) are based on watershed boundaries used by the U.S. Geological Survey Border Environmental Health Initiative (<http://borderhealth.cr.usgs.gov>). The following chapters will provide more precise definitions where needed.





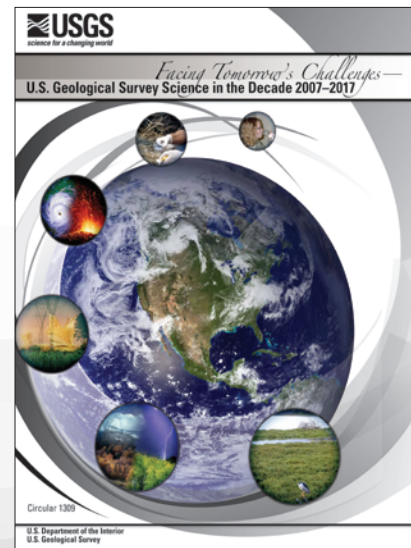




U.S. Geological Survey employees collecting sediment samples in response to the 2010 Deepwater Horizon oil spill

As the principal science bureau of the U.S. Department of the Interior (DOI), the U.S. Geological Survey (USGS) has a unique role to play in the resolution of a multitude of natural and sociological issues in the Borderlands, the area in both countries along the United States–Mexican border (fig. 1–1). The USGS applies geographical, geospatial, biological, hydrological, and geological sciences to these complex issues, and the results of that scientific research provide insight into the area’s natural systems and their relation to human activity. This information is useful to Federal land management bureaus in the DOI, such as the Bureau of Land Management, and other Federal agencies associated with homeland security, agriculture, environment, and health. In addition, as a scientific organization, the USGS has extensive experience in collecting, analyzing, and making available data that are critical to decisionmakers, and perhaps even more importantly, the USGS is an internationally recognized leader in modeling natural systems and making robust forecasts of the future states of those systems.

A central challenge for the USGS is that many of the current and future needs for scientific insight on border issues will require a rigorous multidisciplinary approach that can draw upon the expertise of scientists in fields ranging from geography and geology to biology and hydrology. For example, modeling future stresses on the natural ecosystems of the lower Rio Grande will require studies of the aquatic habitats, hydrologic processes, and geologic evolution of the river. The USGS has recognized the need for multidisciplinary science and has taken a new, aggressive approach to meet these needs. In 2007, the USGS published Circular 1309, “Facing Tomorrow’s Challenges—U.S. Geological Survey Science in the Decade 2007–2017,” in which this new approach is well elucidated and science themes vital to the USGS—ecosystems, climate change, energy and minerals, natural hazards, human health, and the water census—are discussed from a holistic, multidisciplinary perspective. These multidisciplinary science themes that have become the focus of the USGS mission parallel the major challenges in the border region between Mexico and the United States. Because of this multidisciplinary approach, the USGS possesses a unique set of capabilities that can address these challenges.









This circular is intended to provide you—citizen, local decisionmaker, government leader, or private entrepreneur—an overview of what the USGS considers the current and future challenges in the United States–Mexican border region and examples of how the USGS can make a difference in understanding and addressing these issues. The challenges are grouped into seven challenge themes: ecological resources, water availability and quality, environment and human health, people in the Borderlands, energy and mineral resources, natural hazards, and border security and environmental protection. For each of these themes, special “. . . *facing the challenge*” sections in the chapters give examples of specific problems addressed or successes achieved by the USGS. None of these challenge themes can be addressed strictly by one or two science disciplines; all require well-integrated, cross-discipline thinking, data collection, and analysis. Because each of the themes is so complex and in a constant state of change, there are no easy solutions that can be anticipated for the next few years, but the USGS is positioned to provide decisionmakers with the unbiased science necessary to address local and regional problems within these challenge themes.

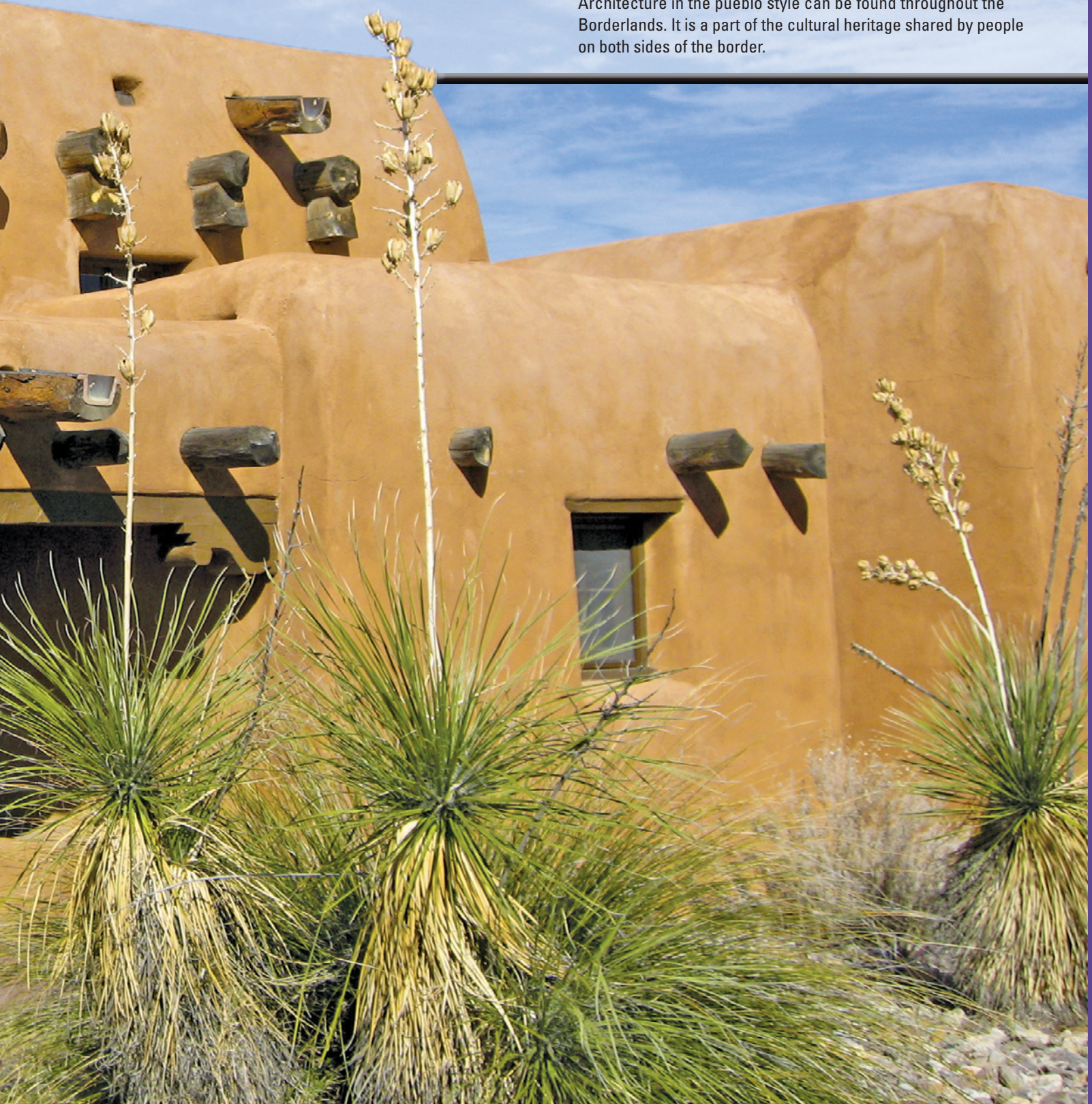








Architecture in the pueblo style can be found throughout the Borderlands. It is a part of the cultural heritage shared by people on both sides of the border.





## Challenges of the Borderlands

The USGS has identified seven challenge themes associated with the Borderlands. Each theme is explained briefly on pages 12 and 13 and will be discussed more fully in the following chapters. It is important to keep in mind that these themes are not isolated unto themselves but are connected by many pathways and interact with one another to amplify the complexity of each theme. Further, it will become evident that the challenges are not one-sided. They do not originate in one country only to become problems for the other; the issues and concerns of each challenge theme flow in both directions across the border. The clear message is that our two nations face the issues in these challenge themes together, and the USGS understands it must work with its counterparts, partners, and customers in both countries.



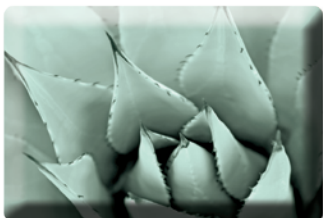
President Barack Obama, United States (left), and President Felipe Calderón, Mexico (right), January 2009



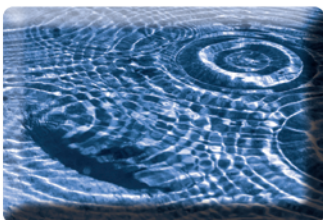




# *borderlands* challenge themes



***Ecological Resources (Chapter 3).***—Along its corridor from the Gulf of Mexico to the Pacific Ocean, the border traverses ecosystems ranging from riparian systems along the Rio Grande in Texas to the coniferous forest “sky islands” of Arizona and the extremely arid regions of southeastern California. Issues associated with biodiversity, invasive species, endangered species indicators, habitat fragmentation, and species loss are major components of this theme.



***Water Availability and Quality (Chapter 4).***—Population growth on both sides of the border, especially in southern California and Arizona, and pressures for sufficient irrigation for agriculture in Arizona, California, Texas, and the northern States of Mexico raise enormous concerns for future water availability. Even in areas where water remains plentiful, the introduction of metals, salts, biochemicals, and pharmaceuticals to surface water and groundwater has greatly degraded the qualities of both of these resources.



***Environment and Human Health (Chapter 5).***—Rapid population growth is occurring in the arid southwestern United States and in the northern Mexican States. This theme includes the growing health concerns related to the fate of hazardous wastes and contaminants introduced into the air, water, and soils of the Borderlands region, as well as pathogens carried by wildlife, domesticated animals, and humans.



***People in the Borderlands (Chapter 6).***—For hundreds of years, the Borderlands have been home to small indigenous and immigrant human populations that have had seemingly little effect on the expansive landscape. In recent years, however, population centers on both sides of the border have grown, leading to intensive agriculture, urban growth, changing land-use patterns, expansion of industry, and destruction of cultural resources. This theme is concerned with the multidecadal effects of these actions, all of which have escalated significantly in recent years and are expected to continue to escalate in the foreseeable future.

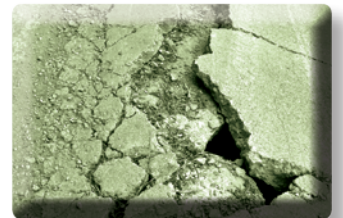




***Energy and Mineral Resources (Chapter 7).***—The exploration for and exploitation of geological resources such as oil and gas, copper, gold, uranium, and mercury have recently accelerated as domestic and global demands have increased. This theme focuses on the assessment of natural resources and resultant economic development that will occur in the Borderlands in the coming decades as a response to an increase in demand, as well as on the environmental effects of the extraction of those resources.



***Natural Hazards (Chapter 8).***—This theme recognizes that the border region is subject to rare but spectacular natural events, including hurricanes on both the California–Baja California and Texas–Tamaulipas coasts; earthquakes in the San Diego–Tijuana sister city area; floods along the Rio Grande in New Mexico, Texas, and Chihuahua; and wildfires in Arizona, California, Sonora, and Baja California. There is a need for continuous monitoring of earth and atmospheric processes that can lead to hazardous events. Populations on both sides of the border also need to receive information before a disaster strikes on the steps that can be taken to reduce risks associated with these natural hazards.



***Border Security and Environmental Protection (Chapter 9).***—Because of socioeconomic contrasts throughout the Borderlands, problems related to border security, terrorism threats, drug and human smuggling, and the degradation of environmental resources are prevalent in the area. Management agencies in both the United States and Mexico have been confronted with increasingly complicated missions that try to address these issues. This theme focuses on providing land management and law enforcement agencies with the information and technological support they require but do not necessarily possess internally.



Although it is not listed as a challenge theme, the issue of climate change cannot be ignored—the scientific community is now in broad consensus that global climate change is happening at an accelerating rate. This phenomenon will affect all regions of the United States, and the Borderlands are no exception. In fact, the effects of climate change are expected to be especially significant in the Borderlands, where even slight climatic fluctuation can have cascading effects on ecosystems and human inhabitants. Because climate change exerts such strong, long-lasting influences on the seven challenge themes in both the United States and Mexico, the issue of climate change as it applies to the Borderlands will be discussed in depth and with a forward-looking perspective (chapter 10).

