Environmental Quality and Border Security:

A 10-Year Retrospective

Eighteenth Report of the Good Neighbor Environmental Board
to the President and Congress of the United States

GNEB
Environmental Advisors Across Borders

September 2017

About the Board

The Good Neighbor Environmental Board (GNEB or the Board) was created in 1992 by the Enterprise for the Americas Initiative Act, Public Law 102-532. The purpose of the Board is to "advise the President and the Congress on the need for implementation of environmental and infrastructure projects (including projects that affect agriculture, rural development, and human nutrition) within the states of the United States contiguous to Mexico to improve the quality of life of persons residing on the United States side of the border."

The Board is charged with submitting an annual report to the U.S. President and Congress. Management responsibilities for the Board were delegated to the Administrator of the U.S. Environmental Protection Agency by Executive Order 12916 on May 13, 1994.

GNEB does not carry out border region activities of its own, nor does it have a budget to fund border projects. Rather, its unique role is to serve as a nonpartisan advisor to the U.S. President and the Congress and recommend how the federal government can most effectively work with its many partners to improve conditions along the U.S.-Mexico border.

The Board operates under the provisions of the Federal Advisory Committee Act, and membership on the Board is extremely diverse. By statute, GNEB comprises representatives from:

(1) the U.S. government, including a representative from the U.S. Department of Agriculture and representatives from other appropriate agencies;

(2) the governments of the states of Arizona, California, New Mexico and Texas; and

(3) private organizations, including community development, academic, health, environmental and other nongovernmental entities with experience on environmental and infrastructure problems along the southwest border.

The Board also includes representatives from tribal governments with lands in the border region.

The recommendations in this report do not necessarily reflect the official positions of the federal departments and agencies that are represented on the Board, nor does the mention of trade names, commercial products or private companies constitute endorsement. Following historic precedent, the federal departments and agencies represented on the Board and the states of Arizona and Texas have recused themselves from this report.

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Eligio "Kika" de la Garza II

September 22, 1927 – March 13, 2017

Representative Kika de la Garza, center, during a 1985 House Committee on Agriculture meeting.
Source: *The New York Times*. www.nytimes.com/2017/03/15/us/politics/kika-de-la-garza-dead.html

The Good Neighbor Environmental Board would like to honor the late Eligio "Kika" de la Garza, who served for 32 years in the U.S. House of Representatives, 14 of these as Chairman of the House Committee on Agriculture. He passed away on March 13, 2017.

Chairman de la Garza passed H.R. 4059, 102nd Congress, the "Enterprise for the Americas Initiative Act of 1992," which became Public Law 102-532. A champion of the North American Free Trade Agreement, Chairman de la Garza included the enabling legislation for establishment of the Good Neighbor Environmental Board in the Act. During 1992 hearings of the House Committee on Agriculture, Chairman de la Garza stated,

"Public input is vital in setting the environmental and infrastructure priorities of EPA's U.S.-Mexico Environmental Plan for the Border. That is why last year I introduced H.R. 4059—which was approved by the Committee last week—to establish a U.S.-Mexico Environmental Board to bring together federal, state and private sector leaders to provide direction in setting these priorities to the President and to the Congress."

This board became the Good Neighbor Environmental Board.

The Board appreciates everything Chairman de la Garza, a Texan from the Lower Rio Grande Valley, championed for the farmers of the United States and the residents of the U.S.-Mexico border region.

Transmittal Letter to the President From the Good Neighbor Environmental Board

President Donald Trump
Vice President Michael Pence
Speaker Paul Ryan

On behalf of your Good Neighbor Environmental Board, I am submitting to you our 18th Report, *Environmental Quality and Border Security: A 10-Year Retrospective.* In this year's report, the Board revisited the issue of environmental protection and security along the border our country shares with Mexico, which the Board first addressed a decade ago in its 10th Report, *Environmental Protection and Border Security on the U.S.-Mexico Border*.

Much progress has been made in the past 10 years to secure our southern border. Although increased security has had positive environmental benefits in some cases, in many other instances more intensive security operations and security-related infrastructure have had, and continue to have, substantial negative environmental impacts.

The U.S.-Mexico border region possesses remarkable landscapes that are both beautiful and fragile and hosts many unique species of animals and plants that are already threatened or in decline. The plants, animals and natural areas of the region are important not only because of their biological diversity, but also because of the economic benefit they provide through a broad range of recreational activities. Habitat loss and disruption of migratory corridors from security related-infrastructure and operations are an ongoing source of concern and ecological stress.

As expanded security infrastructure along our border with Mexico is being considered, the Board urges a thoughtful and considered approach that heeds the experience gained from past efforts to construct security-related infrastructure in the border region. Much has been learned in the last decade on constructing infrastructure that is effective from a physical barrier standpoint and also allows some species to pass freely. There also have been great advances in monitoring and surveillance technologies during the past decade that make the wider use of virtual infrastructure possible, which could achieve security objectives with significantly less environmental impact and at much lower cost.

The Board strongly recommends that planning for additional security infrastructure along the U.S.-Mexico border include extensive and ongoing consultation with the people and communities that would be affected by any construction. The Board remains convinced that it is possible to achieve the security objectives we all desire and minimize environmental impacts through careful and thorough planning to identify the ideal design and technology required for diverse border landscapes.

Thank you for the opportunity to examine this issue and apply the Board's many years of collective experience in addressing border matters. Our lives, communities, livelihoods and heritage are rooted along the border we share with Mexico, and we are committed to preserving and protecting them.

Sincerely,

Paul Ganster, Ph.D.
Chair
Good Neighbor Environmental Board

Executive Summary

The Good Neighbor Environmental Board's (GNEB or Board) 2007 report, *Environmental Protection and Border Security on the U.S.-Mexico Border: Tenth Report of the Good Neighbor Environmental Board to the President and Congress of the United States*, examined the environmental implications of increased border security. In December 2009, the Board issued an advice letter on the environmental effects of the border fence. In this current report, GNEB returns to the theme of environmental quality and protection in the context of existing and proposed border security infrastructure and measures. The previous GNEB documents focused on undocumented border crossings, hazardous materials (hazmat), and environmental effects and mitigation related to border security infrastructure. Although these issues continue to be important when addressing environmental protection in the U.S.-Mexico border region, some conditions have changed in the last decade. In this report, the Board focuses on five key overlapping challenges in which environmental protection intersects with border security:

1. Tourism and recreation economy.
2. Habitat integrity and wildlife corridors.
3. Water management, flooding, and trash and sediment control.
4. Hazmat and emergency response.
5. Air quality.

Security is a broad concept that can be defined in many different ways. "Border security" as used in this report focuses on threats and challenges to national security at the border associated with preventing terrorist activity or entry of potential terrorists and interdiction of illegal or criminal activities. This relatively narrow definition contrasts with broader concepts of "environmental security," which includes the protection and preservation of natural resources, the environment and natural ecosystems. More expansive definitions of security often focus on critical sectors of the food-water-energy nexus. Thus, energy, water and food security are considered key elements of the broader "security" framework. Although this report primarily uses "border security" in its narrower sense, some recommendations may be relevant to the broader picture of environmental security. Although border security is an important national priority, environmental protection in the border region also is of great significance.

Chapter 1 provides background and context for this report, as well as recommendations on environmental protection and border security. Many defining features and characteristics of the U.S. border region with Mexico, a developing nation, make it fundamentally different from other regions in the United States. These features present challenges that regions located within the interior of the United States often do not have

to overcome. The diversity of the border ecosystem, which ranges from areas of great natural beauty and value to areas of large and growing human settlements, creates an additional complexity when analyzing the border region and protecting environmental quality. This chapter addresses the key issues for environmental quality and protection in the diverse geographical regions of the border. Finally, Chapter 1 provides detail on the changes in border security since GNEB's 2007 report that focused on security. These changes include stronger communication and collaboration among security and other agencies, significant increases in physical infrastructure and personnel in the border region, and improved border control and management, including faster border crossing times for goods.

The intersection of border security and the environment impose a number of challenges and opportunities on the border region, and **Chapters 2** and **3** of this report focus on challenges and opportunities related to ecosystems, tourism and outdoor recreation; plant and animal life and habitat integrity; emergency response and preparedness; water management, flooding, trash and sediment control; and air quality. The shape and form of security infrastructure installed along the border is a critical factor affecting these areas of special concern. Also of importance are management practices by security agencies. Additional installation of security infrastructure along the border will have a large impact on the region, presenting both challenges and opportunities to enhance security while preserving or even improving environmental sustainability. Given the scale and cost of the program to enhance border security infrastructure, it is important to get it right the first time, avoiding costly mistakes and even more costly corrective actions. This requires careful planning and advanced coordination with stakeholders in the region.

This report examines the environmental implications of increased border security infrastructure within the context of its previous report from 2007 and its December 2009 advice letter, which both addressed border environment and security. The earlier GNEB documents provided general and specific recommendations for meeting the security and environmental needs of the border region. In this report, the Board's recommendations focus on the intersection of environmental protection and border security in the five key areas identified above. The recommendations in **Chapter 4** can help federal agencies to preserve or enhance environmental protection and quality while increasing the security of the U.S.-Mexico border.✣

Border fence cutting across the steep mountainside of Otay Mountain Wilderness Area in San Diego County. The foreground of the photograph is the Tecate River in Baja California, and the shot was taken from Federal Highway 2D in the municipality of Tijuana, Mexico. Note the winding road that was created by the U.S. Border Patrol to provide access to the fence.

Source: Paul Ganster, San Diego State University (August 2017).

Introduction

A decade ago in 2007, the Good Neighbor Environmental Board's (GNEB or Board) *Environmental Protection and Border Security on the U.S.-Mexico Border: Tenth Report of the Good Neighbor Environmental Board to the President and Congress of the United States* (10th Report) examined the environmental implications of increased border security. Two years later in December 2009, the Board issued an advice letter on the environmental effects of the border fence. In this report, *Environmental Quality and Border Security: A 10-Year Retrospective: Eighteenth Report to the President and Congress of the United States* (18th Report), GNEB returns to the theme of environmental quality and protection in the context of existing and proposed border security infrastructure and measures. The 10th Report focused on two main issues, undocumented border crossings and hazardous materials (hazmat). The December 2009 advice letter addressed environmental impacts and mitigation related to border security infrastructure. All of these issues remain germane to environmental protection in the U.S.-Mexico border region today, but some conditions have changed during the last decade, including a significant decline in undocumented crossings linked to changing economic opportunities as well as to increased security measures. In this report, the Board focuses on five key overlapping challenges in which environmental protection intersects with border security: (1) tourism and recreation economy; (2) habitat integrity and wildlife corridors; (3) water management, flooding, and trash and sediment control; (4) hazmat and emergency response; and (5) air quality.

Security is a broad concept defined in different ways. For example, "border security" as used in this report has a focus on threats and challenges to national security at the border associated with preventing terrorist activity or entry of potential terrorists and interdiction of illegal or criminal activities. This relatively narrow definition contrasts with broader concepts of "environmental security" such as preservation of natural resources; protection of clean air, water and environment; and conservation of the natural ecosystem and the services or benefits provided. More expansive definitions of security often focus on the security and reliability of critical sectors of the food-water-energy nexus and the production of these inputs vital to sustain life and livelihoods. Thus, energy security, water security and food security are increasingly understood to be key elements of the broader "security" framework. Although this report primarily uses "border security" in its narrower sense, several sections and recommendations also may be relevant to broader framings of environmental security.

Border security is an important national priority, and environmental protection in the border region is of critical importance, given the rich natural resource endowments of the region. The border region includes the area 60 miles (100 kilometers) on either side of the international boundary, although border ecosystems and natural features extend beyond this zone. Of the 1,954-mile length of the southern border, almost 780 miles (40%) are U.S. Department of the Interior (DOI) lands (Andrew 2017a). The U.S-Mexico border region (within 100 miles of the border) contains 185 federal land units under DOI jurisdiction (Bureau of Indian Affairs, Bureau of Land Management [BLM], Bureau of Reclamation, U.S. Fish and Wildlife Service [FWS], and National Park Service [NPS]) totaling 25,388,431 acres (Andrew 2017b), including national parks and protected areas (**Figures 1** and **2**). There are 26 federally recognized tribes within the border region, and the Tohono O'odham Nation's land is split by the international border line. In addition, local governments, nonprofit organizations and U.S. states also manage protected areas along the U.S.-Mexico border.

Mexico also has significant protected areas within the border region. More than 6,500 animal and plant species reside within the U.S.-Mexico border region (Kolef et al. 2007). On the Mexican side, 235 species found in the border region are classified in a risk category. Of these, 85 are considered endangered under Mexico law. In the United States, 148 species found in border counties are listed as endangered under the U.S. Endangered Species Act (Kolef et al. 2007).

As of 2010, 14.4 million people live in cities, towns and rural areas in the U.S.-Mexico border; these communities need access to clean water and sanitation services, clean air, green spaces, and healthy environments. Tourism and outdoor recreation generate substantial revenues and support thousands of jobs in local communities, all of which depend on the quality of the border's environment.

Despite its natural and human assets, the U.S.-Mexico border region faces serious environmental challenges, including an increasingly scarce water supply; proneness to flooding, drought and wildfires; and uncon-

trolled urban expansion. Climate change is projected to increase temperatures, decrease precipitation, produce more extreme weather events, decrease snowpack and runoff, reduce renewable surface and ground water resources, and bring about more frequent and intense wildfires and dangerous storm surges in the region (GNEB 2016). Traditional infrastructure systems are ill-equipped to allow border communities to mitigate these impacts, which will affect many sectors, including water, energy, trade, transportation and public health. The disadvantaged populations of border communities, including tribal populations, are particularly vulnerable to the health effects of climate change. Some animal and plant species and ecosystems in the border region also are at risk.

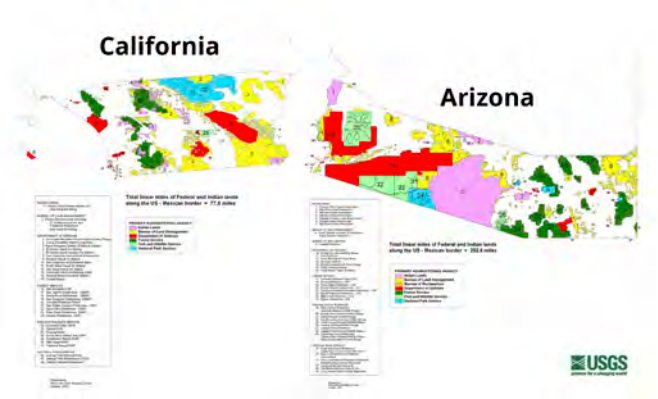


Figure 1. U.S. Department of Interior lands: California and Arizona.
Source: U.S. Geological Survey.

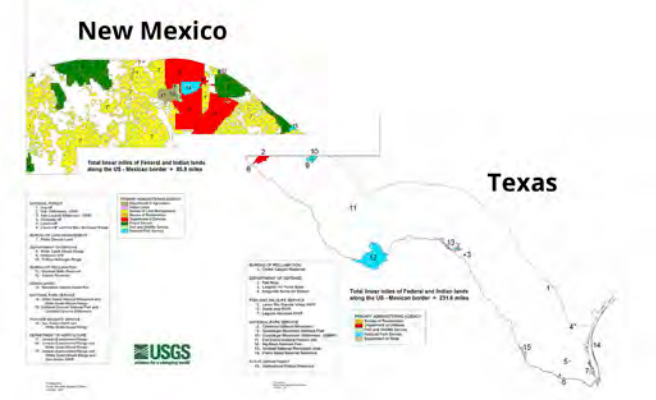


Figure 2. U.S. Department of Interior lands: New Mexico and Texas.
Source: U.S. Geological Survey.

The fragile natural environment of the border region underscores the need for careful planning and coordination among federal agencies to mitigate the effects as border security infrastructure is built out and enforcement activities intensify. Although 10 years have passed since GNEB published its 10th Report, the southwest border environment and socioeconomic contexts are dynamic and require continual adaptation of policies and actions to respond to emerging challenges and changing conditions. In this report, GNEB identifies the most pressing environmental challenges that may overlap with border security and also provides recommendations to accomplish the goals of environmental protection cooperatively with border security.

The international boundary adds complexities and costs for U.S. border communities in their attempts to address regional environmental issues. Organizing a proper emergency response system is greatly complicated by the international boundary, as is dealing with regional air pollution issues when part of the airshed is located in Mexico. Other examples of environmental issues that ultimately have only binational or international solutions include conservation, water quality protection, aquifer management, watershed management, and solid and hazardous waste.

The governments of the United States and Mexico have responded to the challenge of border environmental issues with a number of measures, including the 1944 Water Treaty for the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande (1944 Water Treaty), the 1983 La Paz Agreement and its implementation plans (e.g., the U.S.-Mexico Border 2020 Program [Border 2020]), and the creation of the binational institutions of the North American Development Bank (NADB) and the Border Environment Cooperation Commission (BECC). The trilateral environmental organization formed as a side agreement to the North American Free Trade Agreement (NAFTA) in 1993, the Commission for Environmental Cooperation (CEC), also addresses border and transboundary environmental issues. Although these efforts to address border environmental problems have had very positive results, they still have been insufficient to meet the needs of dynamic border communities with growing environmental problems.

CHAPTER 1
Border Context

This chapter provides background and context for GNEB's 18th Report and recommendations on environmental protection and border security. Section 1.1 provides an overview of the demographic and economic context of the border region, and Sections 1.2 and 1.3 then address the environmental and border security contexts, respectively, of the region.

1.1 Demographic and economic context

Many defining features and characteristics of the U.S. border region with Mexico, a developing nation, make it fundamentally different from other regions in the United States. These include rapid economic and population growth; rapid urbanization; shared natural resources such as rivers, ground water and airsheds; economic, cultural, and political differences and asymmetries with Mexican communities across the border; international commerce and trade flows; high rates of poverty; and diverse ethnic identities. These features all present challenges that regions located within the interior of the United States often do not have to overcome.

1.1.1 Population and urbanization

Since the 1940s, the population of the 10 U.S. and Mexican border states has grown more rapidly than the national averages and, at the same time, the populations of the counties and municipalities along the border have grown faster than the states in which they are located. Driven by migration, the populations of Mexican municipalities have grown at a faster rate than their U.S. counterparts, usually at twice the rate. These trends make the border region the most demographically dynamic region of the United States and of Mexico. By 2000, some 12.4 million people lived in the border counties and municipalities (Peach and Williams 2000), and by 2010 that figure had reached 14.4 million, concentrated largely in binational metropolitan sister cities. By 2020, the border population is projected to reach 19.5 million (**Figure 3**). Most of the border's population resides in 15 paired U.S. and Mexican interdependent sister cities (**Figure 4**); the remaining residents live in smaller settlements or in rural areas. Tribal and indigenous communities are an important component of the border, both in urban and rural areas. Population growth in the region puts pressure on air, water and land. It also creates additional demands for services—such as water supply and wastewater treatment—to ensure a safe and healthy living environment. Growth also puts pressure on surrounding land and habitat (USEPA and SEMARNAT 2016).

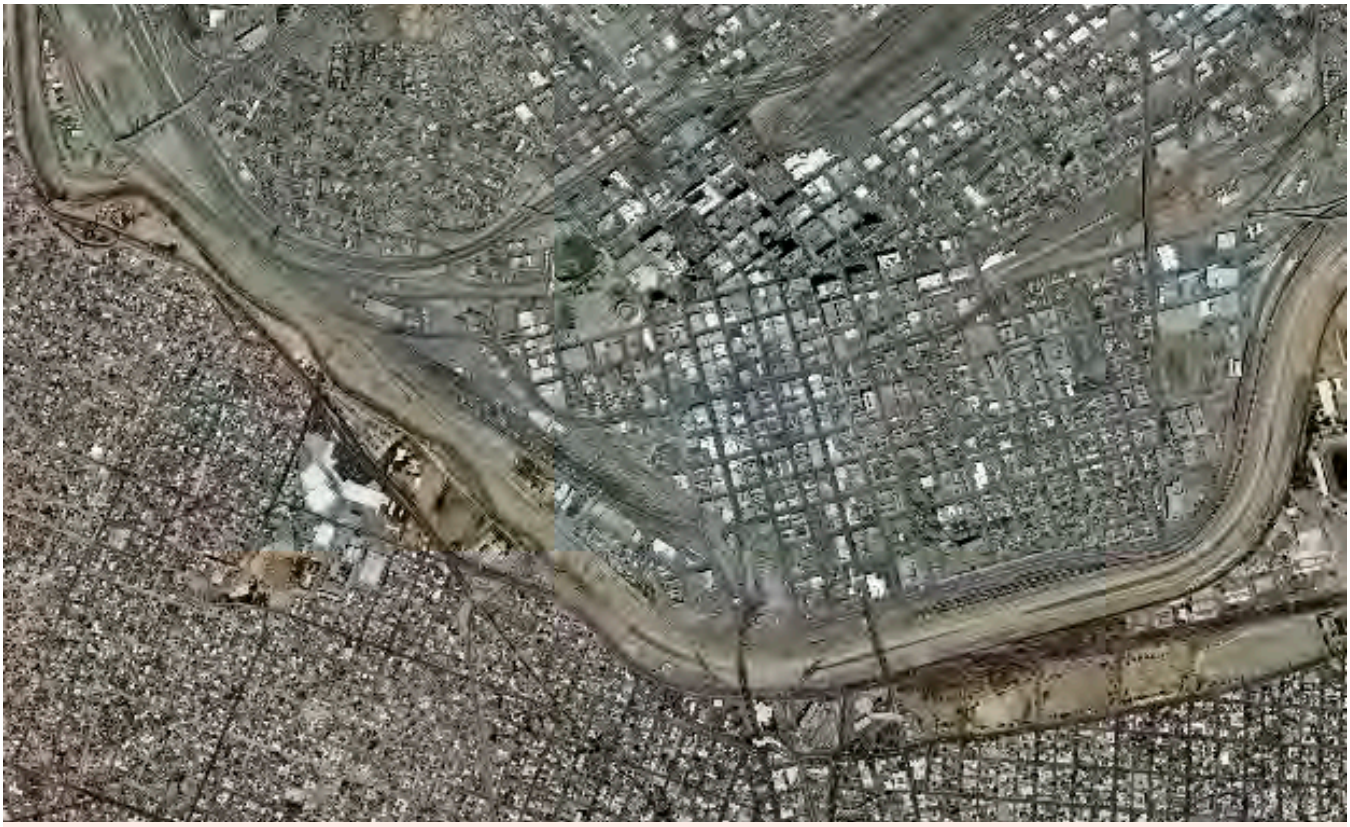
Urban growth often outpaces the ability of government to provide adequate infrastructure in these border cities, especially on the Mexican side of the boundary where much of the urbanization has been unplanned (Ganster and Lorey 2016). In burgeoning cities such as Ciudad Juárez, Nuevo Laredo, Nogales, Mexicali and Tijuana, lands were settled and houses were constructed, and then water and wastewater infrastructure installation occurred years afterward. In areas of the U.S. border region, principally in Texas and New Mexico, but also in Arizona and California, *colonias*—residential communities in rural areas of counties lacking basic services such as water, sewage, electricity

Population and Population Growth in the Border Region			
	Population 2010	**Avg. Annual Growth (%), 2000-2010**	**Duplication Time (Years)**
Counties and Municipios			
Mexico, border municipios	7,304,901	2.24	31
United States, border counties	7,303,754	1.62	43
Total	14,608,655		
100/300 kilometers			
Mexico, 300 km	17,048,419	2.04	34
United States, 100 km	13,967,038	2.28	30
Total	31,015,457		
Border States			
Mexico	19,894,418	1.95	36
United States	70,850,713	1.49	47
Total	90,745,131		
Mexico	**112,336,538**	**1.52**	**46**
United States	**308,745,538**	**0.97**	**71**

Source: U.S. Census Bureau and INEGI.

Figure 3. Population and population growth in the border region.
Source: Lee et al. (2013).

Figure 4. Map displaying the 15 U.S.-Mexico sister city pairs.
Table 3 in Section 3.1 provides a list of the sister city pairs.
Source: Modified from Rainer Lesniewski/Shutterstock.com.



The dense urban populations of El Paso, Texas (top), and Ciudad Juárez, Chihuahua, are separated only by the meandering channelized Rio Grande and border security fencing.

Source: Google Earth.

and often paved roads—developed without standard infrastructure. In Texas alone, the Texas Secretary of State found that in 2014, nearly 38,000 residents in the six largest border counties with *colonias* lacked potable water or sewer services (Texas Secretary of State 2014). Thus, on both sides of the border, large numbers of residents do not have safe potable water piped into their homes and/or lack proper sewage collection and treatment services. Many border residents do not have the same levels of water and sewage services as their fellow citizens elsewhere in the United States.

A major difficulty for environmental progress along the U.S.-Mexico border is that although the U.S. border region is one of the poorest areas in the United States, the border region of Mexico is one of the wealthiest areas of that country. This fact has made it politically difficult for Mexican federal authorities to spend funds on border environmental infrastructure when there are more pressing needs elsewhere in the country. In addition, in the past few years, U.S. Environmental Protection Agency (EPA) funds dedicated for border water and sewer projects have declined and in the President's fiscal year (FY) 2018 budget, were proposed for elimination (Office of Management and Budget 2017).

1.1.2 North American Free Trade Agreement (NAFTA) and the border

When NAFTA was being negotiated and debated in Congress in the early 1990s, many border residents had hopes that the trade agreement would address the environmental problems of their communities and bring economic development, including well-paying jobs (Ganster and Lorey 2016). Although NAFTA produced a large increase in trade and investment, it did not create the expected prosperity in U.S. border communities. NAFTA stimulated commerce and created many jobs along the border, but those jobs tended to be low-skill and low-paying, while border communities lost higher paying assembly and manufacturing jobs that moved into Mexico and elsewhere offshore. The border sister cities are vital economic gateways to hundreds of billions of dollars in trade flows each year. This trade growth, however, brought increased vehicular crossings that saturated the existing border

infrastructure and overwhelmed communities along the major trade corridors with more air pollution, producing health and safety concerns. Regions throughout the United States benefited from the growth of NAFTA-related trade and investment (Wilson 2017), yet border communities absorbed a disproportionate share of the environmental costs related to congestion.

Ports of entry (POEs) also have substantial economic and environmental effects on U.S. border communities because of the enormous quantities of freight that move through the trade corridors with Mexico and the long crossing wait times for commercial and noncommercial vehicles. In 2007, wait times for personal and commercial crossings from Tijuana to San Diego alone cost the U.S. and Mexico economies an estimated $7.2 billion in foregone gross output and more than 62,000 jobs (San Diego Association of Governments 2007). If compiled for the entire border, the figure for losses produced by long wait times would be enormous, in excess of $10 billion per year. The costs are absorbed by border communities but benefit communities throughout the United States.

1.1.3 Poverty and ethnicity

An analysis of recent U.S. Census Bureau data (U.S. Census Bureau 2017a) showed that when ranked as a state, the 24 counties bordering Mexico (excepting San Diego County, California,[1] and Pima County, Arizona), would rank 51st—or dead last—in income and percentage of persons under 65 without health insurance. The border counties also would rank last in percentage of persons age 25 years or older with a high school diploma or higher and lowest in *per capita* income. In some cases, the differences are staggering; for example, only 69.1 percent of residents of these counties over age 25 are high school graduates, with the next lowest state, California, having an 81.8% high school graduation rate. When San Diego and Pima counties are included, the counties in the four U.S. states bordering Mexico still would rank 48th in poverty rate, 44th in persons under age 65 without health insurance, 51st in percent of residents older than age 25 who are high school graduates, and 43rd in *per capita* income. All of these are indicators of regions of poverty (U.S. Census Bureau 2017a).

Hispanics constitute the largest ethnic group in the border region, are the largest minority group in the United States, and are a majority of the population in 19 of the 24 counties along the international border with Mexico. In 2015, 82 percent of the population of the border counties, excluding San Diego and Pima counties, was Hispanic (U.S. Census Bureau 2017a). The percentage of Hispanics in the U.S. border population is increasing as a result of continuing migration from Mexico and the relatively high birth rate of border Hispanic populations compared with the general population.

Photo of a giant toddler peering over the pedestrian fencing near the port of entry at Tecate, California, with a U.S. Border Patrol agent in the foreground on an ATV. The installation is by a French artist who uses the moniker "JR" and hopes to prompt discussion about the cultural and ethnic implications of immigration.

Source: Paul Ganster, San Diego State University (September 2017).

Adding to the cultural and economic complexity of the border region are 26 U.S. federally recognized Native American tribes that range from 9 to 28,000 members. Some of these tribes share extensive family and cultural ties to indigenous peoples in Mexico's border region and occupy land adjacent to the international boundary.

The border area is a region where poverty and ethnicity coexist. It also is a region where the large vulnerable population is harmed by the health effects of deteriorated environmental conditions.

1.2 Environmental protection context

This section addresses the key issues for environmental quality and protection in the diverse geographical regions of the border. A number of national parks in both countries—including Big Bend National Park in Texas, Maderas del Carmen Biosphere Reserve in Mexico, Organ Pipe Cactus National Monument in Arizona, and El Pinacate and Gran Desierto del Altar Biosphere Reserve in Mexico—are spectacular and remote. Deserts, mountains and riparian areas help to

[1] The southern part of San Diego County has socioeconomic characteristics similar to other border counties; North San Diego County is more affluent and less Hispanic.

Organ Pipe Cactus National Monument at sunrise.
Source: Anton Foltin/Shutterstock.com.

provide great diversity in plant and animal species and contribute to ecotourism. In addition to these federal lands, important state and local public lands exist along the border, including the three state-owned sites that form the World Birding Center in the Lower Rio Grande Valley, the Rio Bosque in El Paso, and Big Bend State Ranch, which also provide important habitat and local economic development. The states of New Mexico, Arizona and California also have state parks and protected areas in the border region. The border has areas of great natural beauty and value. Other portions of the border have large and growing human settlements that depend on environmental quality. This section also provides an overview of pertinent management agencies and programs.

1.2.1 Environmental challenges

The natural environment and climate of the border region provide a number of challenges for environmental quality and sustainability of communities. The border is mostly arid, with annual precipitation averaging 28 inches per year in the Lower Rio Grande Valley in Texas, decreasing to about 7 inches per year in the Trans Pecos area of Texas, and finally decreasing to 3 inches annually in Imperial Valley, California.

The region's environmental quality and health are influenced by trends in population, the economy and industrial activity, as explained in the previous section. Specific environmental challenges include air and water quality, land management and protection of sensitive ecosystems and species, and waste disposal, all of which have implications for public health, especially for low-income populations.

Air quality

Air quality in the border region is affected by pollutants from a number of sources. Motor vehicles, power plants, industrial facilities, agricultural operations, mining, dust from unpaved roads and open burning (e.g., for heating, cooking and trash disposal) all influence urban and regional air quality along the U.S.-Mexico border. POEs, characterized by intense motor vehicle traffic and long crossing delays northbound, have air quality implications that affect the facilities and surrounding communities (Quintana et al. 2015). The most common and harmful pollutants from these sources and at POEs include suspended particulate matter (fine and coarse) and ground-level ozone.

The United States and Mexico continue to collaborate to help safeguard the health of border residents by

Cars line up at the U.S. Customs and Border Protection inspection station at San Ysidro, California, thought to be the busiest land port in the world.
Source: JohnGK/Shutterstock.com.

protecting and improving air quality in shared air basins. The two federal governments—in partnership with border tribal, state and local governments—have worked collaboratively to increase knowledge about pollution sources and effects, establish monitoring networks in several key areas, develop emissions inventories, demonstrate the benefits of using cleaner fuels, retrofit diesel vehicles, collaborate on projects to reduce emissions, and build local emergency response capacity through training (USEPA and SEMARNAT 2016). The creation of the Joint Advisory Committee for the improvement of air quality in El Paso–Ciudad Juárez in 1996 under Appendix 1 to Annex V of the La Paz Agreement has been especially proactive at addressing transborder air quality issues (Joint Advisory Committee 2017).

Although substantial gains have been made, air quality still is a major concern throughout the border region. The pressures associated with industrial and population growth, differences in governance and regulatory frameworks, and topographic and meteorological conditions combine to present a challenging context in which to address air quality management. The number of days exceeding the ozone and particulate matter standards has decreased during the past decade (USEPA and SEMARNAT 2016); however, lengthy wait times at POEs, undocumented crossings in undeveloped areas, and patrolling using unpaved roads adversely affect air quality (USEPA 1988, 1998, 2006).

Northbound crossings increased with growing trade after the signing of NAFTA, and wait times further escalated with increases in security after the terrorist events of September 11, 2001 (Quintana et al. 2015), referred to hereafter as 9/11. Frequently, pedestrian lines are immediately adjacent to the vehicle queues (Quintana et al. 2015), resulting in pedestrians' exposure to air with higher pollutant levels than extant in the already-compromised air quality of the border region (Smith et al. 2001). Such near-traffic exposures have been associated with a variety of adverse health effects, including asthma and cardiovascular issues (Quintana et al. 2015). These exposures are a matter of concern not only for the millions of people who cross each year, but also for the thousands of people employed at the POEs and those who live in nearby neighborhoods. In a white paper produced for the U.S. Department of Transportation (Kear et al. 2012), commercial vehicle emissions were noted to be substantially greater than from privately owned vehicles despite the fact that commercial vehicles comprise only approximately 15 percent of the traffic volume in the case study conducted. Therefore, the authors concluded that efforts to minimize commercial wait times would result in the greatest improvements in POE air quality. Reduction of wait times for noncommercial vehicles also would benefit air quality at the crossings.

Water access and quality

In addition to air quality, water access and quality are important issues in the U.S.-Mexico border region. Water is an extremely limited resource in many parts of this region. Population growth—along with growth in agriculture and other economic activity—places increasing stress on water quantity and quality. Protecting the quality of rivers, oceans and other water sources is important for ecological and human health and prosperity in the region. The historic ambient temperature increases and long-term drought associated with climate change point to declines of fresh water supply in the border region (GNEB 2016).

The United States shares 1,954 miles of border with Mexico. The land border and rivers that make up the

international boundary fall under the jurisdiction of the International Boundary and Water Commission (IBWC) (Figure 5). The IBWC comprises two sections, the U.S. Section (USIBWC) and the Mexico Section, and is responsible for applying the boundary and water treaties and settling differences that arise in their application.

Figure 5. The U.S.-Mexico international boundary.
Source: IBWC.

Rapid population growth in the border region, combined with lack of adequate infrastructure, has brought major public health and environmental concerns for both countries as a result of frequent raw sewage discharges. These renegade sewage flows contaminate surface water and adjacent beaches, posing health threats to workers and community members who come into contact with these waters (CBP 2017a). Major populations in cities such as San Diego, California, and El Paso, Texas—in addition to the populations of smaller towns and rural areas—depend on scarce ground and surface water to meet current demands for urban and agricultural uses and also for ecosystem services. To meet these needs for potable water, border communities must employ expensive and complicated solutions, such as transporting water across long distances, desalinating saline ground water, and in the case of El Paso, directing reuse. Two major river basins—the Colorado and Rio Grande—and smaller ones, such as the San Pedro and Tijuana, supply water for municipal, agricultural and other uses. Climate effects, including long-term drought on the Colorado River, suggest that fresh water resources will decrease in the future.

The U.S.-Mexico Border Water Infrastructure Program was created in the 1990s under the La Paz Agreement as a binational effort to provide border communities with safe drinking water and sanitation. EPA and the Comisión Nacional del Agua (Mexico's National Water Commission, also known as CONAGUA) coordinate with U.S. and Mexico federal, state and local agencies to fund drinking water and wastewater infrastructure projects, recognizing that access to these basic public health services is of the highest priority (USEPA and SEMARNAT 2016). No comprehensive data on drinking water and sanitation infrastructure needs along the border are available for comparison purposes. EPA, however, has tracked the number of homes provided with first-time access to essential drinking water and wastewater services through the Border Water Infrastructure Program. From 2006 to 2015, 65,665 homes had been connected to a safe community drinking water system, and 626,631 homes were connected to adequate wastewater collection and treatment service (USEPA and SEMARNAT 2016). This effort shows that a binational government effort is essential to provide border residents with basic services that most of the U.S. population takes for granted.

Solid and hazardous waste

In addition to being affected by air and water pollution, land in the border region can be impacted by improper disposal of solid waste and negative effects from urban, industrial and agricultural activities. Border 2020, the most recent iteration of the joint U.S.-Mexico Border Environment Program, focuses on addressing land contamination from inadequate management and disposal of solid and hazardous waste and sites contaminated by solid or hazardous waste (USEPA and SEMARNAT 2016). Since 2006, *per capita* waste disposal in the United States and border states has declined according to data related to municipal solid waste. Similarly, all Mexican border states have seen a decline in *per capita* municipal solid waste generation, with the exception of Baja California, from 2005 to 2012 (USEPA and SEMARNAT 2016). Reduction of waste generation and increased recycling are evident and should coincide with a decrease in improper disposal. Certified electronic recyclers now are found within 100 kilometers on both sides of the southern border.

Intersection with border security

Some environmental challenges are especially relevant based on their close relationship with border security. Contaminated surface waters—including intermittent flows in arroyos, rivers, drains and lakes—present

USBP agents come into contact with contaminated water at a number of locations along the border.

Source: wbang70/Shutterstock.com.

health dangers for the U.S. Border Patrol (USBP) and other law enforcement personnel who come into contact with these waters in the course of their duties. Untreated raw sewage and unknown chemical contaminates are of particular concern in the Tijuana Estuary where health issues have been reported by USBP agents performing interdiction activities (CBP 2017a). Poor air quality in the major sister city metropolitan areas of the border, and especially around the POEs, creates unhealthy air quality for U.S. Customs and Border Protection (CBP) officers and USBP agents who work in those areas.[2] Urbanization and other land cover changes, including the installation of security infrastructure and the increased number of intense storm events that has accompanied changes in climate, have accelerated erosion in some areas, posing problems for enforcement activities.

1.2.2 Protected areas and the border

The border region has significant protected areas (see Figures 1 and 2 in the introduction), including national parks, national forests, national monuments, wildlife refuges, estuaries and riparian conservation areas. In addition to these national and other federal lands, states and local governments also have invested in significant ecological areas. Some of these are adjacent to protected areas across the border, forming important transboundary ecosystems. Protected areas along the border include habitat for hundreds of sensitive, threatened and endangered animal and plant species (Baverstock 2017; Ceballos and Pacheco 2017; Greenwald et al. 2017; Kolef at el. 2017) and, in many cases, are on established flyways for migratory birds. The integrity of species and habitats has been challenged by tactical security infrastructure at a number of locations along the border, fragmenting habitat and creating barriers to the migration of threatened and endangered animal species. In some areas, the visual impact of border security in pristine scenic areas presents a challenge.

Mule deer approaching the border wall in the San Pedro region of southeastern Arizona, 2008.

Source: Anonymous.

Threatened and endangered animal species, often present in small numbers, require large areas of linked habitat to promote migration and genetic diversity, assuring the health and continuance of the population in question. Important species along the border that require movement across the international boundary to maintain healthy, genetically diverse populations include the Sonoran pronghorn antelope (*Antilocapra americana sonoriensis*), cougar (*Puma concolor*), bighorn sheep (*Ovis canadensis*), jaguar (*Panthera onca*), ocelot *(Leopardus pardalis*), Mexican long-nosed bat

[2] USBP agents and CBP officers are part of the broader CBP. Because USPB agents patrol the border between the POEs, they are most likely to come into contact with contaminated surface water.

Santa Elena Canyon in Big Bend National Park. Installation of the proposed wall would severely impact the views as well as the migration corridor for animals in addition to having no flood plain for border security infrastructure.
Source: Krista Schlyer.

(*Leptonycteris nivalis*) and black bear (*Ursus americanus*). In some areas of the region, physical infrastructure has created barriers that prevent this natural migration. For some species, the problems for wildlife created by this infrastructure are similar to barriers created by highways and freeways. For example, in southern California, mountain lions must cross major freeways, resulting in high mortality rates and reducing the genetic diversity of isolated populations (Phys.org 2017). Potential solutions to the current problem include adding wildlife overpasses or underpasses, which are very expensive; however, proactive planning to address the needs of species to migrate across the border can be cost-effective, while meeting both security and environmental needs. At a segment of the fence near Brownsville, Texas, small openings at the base of the fence placed about every 500 feet are meant to permit passage of the endangered ocelot and other small animals, but it is not known whether ocelots actually use these "cat holes" (Collier and Satija 2017).

The U.S. Attorney General was provided the authority to waive certain environmental laws to expedite the construction of border infrastructure pursuant to the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as amended. In 2005, as a part of the REAL ID Act of 2005, Congress amended the Illegal Immigration Reform and Immigrant Responsibility Act to expand the scope of the limited waiver authority to include cultural considerations in addition to environmental laws and transfer the waiver authority to the Secretary of the newly established U.S. Department of Homeland Security (DHS). Two waivers were issued in 2007—the Barry M. Goldwater Range and San Pedro. Following that, two waivers were issued in 2008—"All Segments," which included projects in California, Arizona, New Mexico and Texas, and the "Hidalgo" waiver that included a discrete project in Texas. On August 2, 2016, a *Federal Register* notice was published for a 15-mile waiver in San Diego. In addition, another waiver has been signed but has not yet been published in the *Federal Register* as of September 2017. The 2008 waiver use was supported by DOI and led to a pledge to mitigate impacts on the environment. Under this pledge, $17.8 million was provided by CBP for mitigation (Andrew 2017a), and measures were taken

Cat hole in the border fence in the Brownsville, Texas, area. Note how the posts in the center of the photograph have been cut back to create a space for the passage of small animals.

Source: Callie Richmond, *The Texas Tribune*.

to successfully mitigate the negative environmental effects. CBP prepared Environmental Stewardship Plans and surveys of biological and cultural resources for all work completed under the waivers.

1.2.3 Case study: Habitat restoration of areas damaged by foot and vehicle traffic[3]

At the time of GNEB's 10th Report, levels of illegal smuggling of humans and drugs had reached record highs in southern Arizona. The passage of thousands of illegal border crossers across public lands, many using vehicles, and the law enforcement response to control them, resulted in a large number of undesignated vehicle routes being created in designated wilderness (NPS 2014). The level of disturbance to public lands was evaluated in several reports and depicted using 30-centimenter resolution aerial imagery (Figure 6). Environmental effects were categorized according to the level of impact on desert habitat; a Class 1, the lowest category, was defined as a one-time pass by a vehicle, whereas the highest category, Class 4, was defined as multiple undesignated vehicle routes with deep rutting.

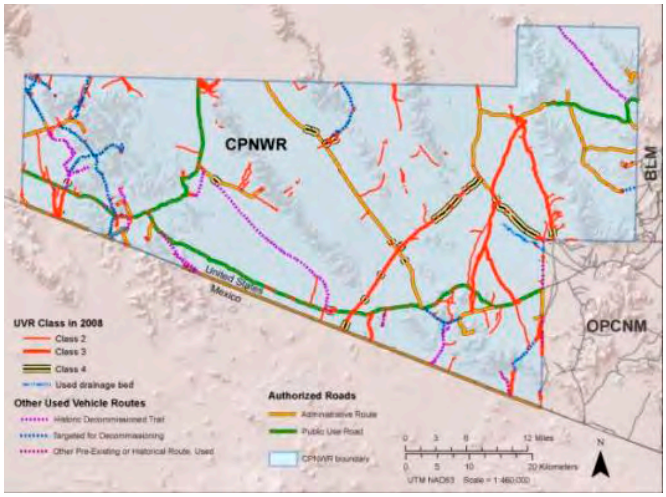


Figure 6. Unauthorized vehicle routes in Cabeza Prieta National Wildlife Refuge, 2008.
Source: NPS (2014).

[3] Source: Jon Andrew Organ Pipe Cactus National Monument Case Study—Undesignated Vehicle Route Restoration.

Beginning in February 2015, work began to reverse these effects using CBP's infrastructure mitigation funds (2008 waiver). Organ Pipe Cactus National Monument was the lead DOI unit managing the restoration program, working in close coordination with USBP's Ajo Station. The 2006 *Memorandum of Understanding Among U.S. Department of Homeland Security and U.S. Department of the Interior and U.S. Department of Agriculture Regarding Cooperative National Security and Counterterrorism Efforts on Federal Lands Along the United States' Borders* (hereinafter referred to as the 2006 MOU), was a key component of the restoration effort and formalized a unique relationship and mutually successful partnerships. The first step in the process was to identify access required by USBP for border security after evaluating all existing routes. Once this was determined, the remaining undesignated access routes could be considered eligible for restoration.

Restoration was accomplished with various methods, ranging from hand tools to mechanized equipment in an attempt to restore the topographic grade and re-establish the natural flow of water during monsoonal rain events. Plants grown in the Organ Pipe Cactus National Monument nursery and cacti recovered from construction of the pedestrian fence were planted at the beginning of many undesignated vehicle routes, whereas areas beyond sight relied on the natural seed bank to provide future vegetative cover. On completion of restoration activities in the summer of 2015, some 230 miles of undesignated access routes were restored on all three DOI-managed lands within Pima County (**Figure 7**). Restored areas were marked with a simple signage system, and an agreement with the USBP assured that patrol agents would be informed of the protocol for access that would allow the areas to be grown back and complete restoration.

Endangered Sonoran pronghorn antelope were observed in one area of Organ Pipe Cactus National Monument soon after restoration had been completed. Presence of this species in a restored road corridor is clear evidence that mitigation funds have achieved the stated goals and purpose. This cooperative project exemplifies the progress in the relationship between the USBP and DOI. It also shows that providing the necessary support for border security and protecting public lands are compatible and not mutually exclusive goals. In 2015, this project was recognized with the Wes Henry National Wilderness Stewardship Award and the NPS Regional Wilderness Stewardship Award: Wilderness Champion.

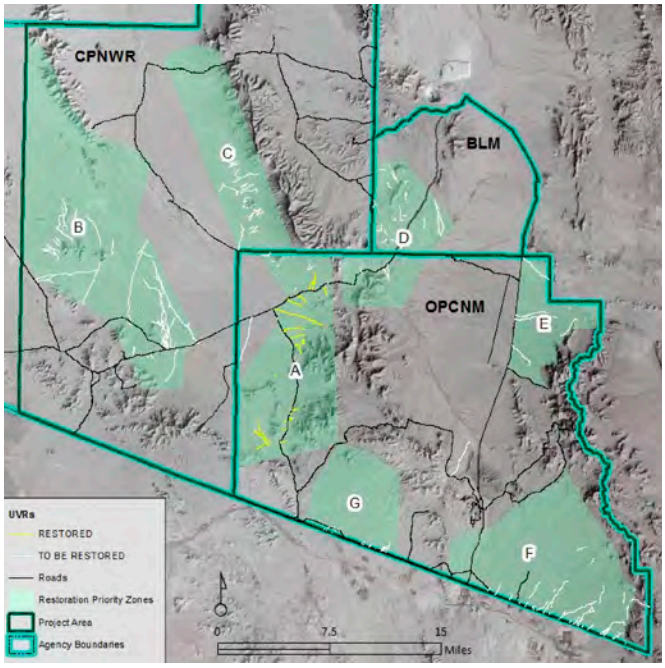


Figure 7. Undesignated vehicle routes that have been restored or identified to be restored, Cabeza Prieta National Wildlife Refuge and Organ Pipe Cactus National Monument, 2015.
Source: NPS; Jon Andrew Organ Pipe Cactus National Monument Case Study—Undesignated Vehicle Route Restoration.

A typical restoration site with pre- and post-restoration conditions.
Source: NPS. www.nps.gov/orpi/learn/nature/interagency-restoration.htm

1.2.4 Progress on environmental quality and protection

Much progress made on improving environmental quality in the border region relates to Border 2020, a cooperative program between the United States and Mexico initiated in 2013 as a successor to Border 2012. Border 2020 is the latest cooperative initiative implemented under the 1983 La Paz Agreement, building on previous efforts, particularly the Border XXI Program, which marked the first binational effort to develop environmental indicators for the border region. Border 2020's mission is to "protect the environment and public health in the U.S.-Mexico border region, consistent with the principles of sustainable development." Through Border 2020, federal, state, tribal and local institutions and agencies collaboratively work to produce prioritized and sustained actions that consider the needs of border communities. The actions implemented under Border 2020 are guided by a series of results-oriented goals and objectives. Border 2020's goals and objectives were updated at the end of the Border 2012 period to reflect new needs and opportunities in the region (USEPA and SEMARNAT 2016).

Additional environmental quality and protection progress has been made as a result of the efforts of binational institutions. BECC and its sister agency NADB, through cooperation with EPA and other agencies, have significantly improved water, wastewater and solid waste infrastructure in border communities through grants, loans and technical assistance. The agencies more recently have begun to address air quality issues through investment in road paving, alternative energy and transportation infrastructure (BECC 2017; NADB 2017).

1.3 Context for security in the border region

The previous section provided a brief overview of major environmental quality and environmental protection challenges in the border region in addition to describing key federal agency responsibility for environmental management and protection. This section provides detail on the changes in border security since GNEB's 2007 report. These changes include stronger communication and collaboration among security and other agencies. They also include significant increases in physical infrastructure and personnel in the border region. Finally, the changes involve improved border control and management and faster border crossing times for goods.

Mobile vehicle surveillance systems provide the flexibility to adapt to dynamic border conditions.

Source: DHS. www.dhs.gov/news/2015/05/13/written-testimony-cbp-senate-committee-homeland-security-and-governmental-affairs

1.3.1 Strengthening communication and collaboration

Since 2007, considerable progress has been made in improving communication and collaboration among security agencies and natural resource agencies in the border region (U.S. Government Accountability Office 2011). Guided by the 2006 MOU, regular, ongoing collaboration now is part of standard operating practices. Representatives from the MOU agencies hold monthly coordination calls to discuss ongoing initiatives, projects and consultations under the Endangered Species Act of 1973. These calls are organized by CBP's Energy and Environmental Management Division.

In 2005, USBP established the Public Lands Liaison Agent (PLLA) Program, and in 2009, the Chief of USBP signed the PLLA Program into national policy (Koerner 2012). Today, all sector chiefs have an on-staff PLLA to engage with federal, state, local and tribal partners. PLLA duties include engagement with personnel from DOI, the U.S. Department of Agriculture (USDA), and other federal, state, local, tribal and nongovernmental organizations involved in land management, resource protection and borderlands access issues. The PLLAs also promote dialogue that includes collaboration to

identify mutually beneficial activities and outcomes as well as joint environmental education, border security and border safety training. Agents serving as PLLAs receive advanced training on environmental matters. They regularly coordinate with other USBP liaisons and remain actively engaged in preparation and review of environmental documents, including those prepared under the National Environmental Policy Act (NEPA) for activities within their sector. They monitor changes in land-use designation (e.g., wilderness designation) within their sector and communicate that information throughout the sector. They also provide outreach regarding candidate and protected species under the Endangered Species Act. Finally, they serve as co-chairs with representatives from DOI and USDA for Borderlands Management Task Force (BMTF) meetings.

USBP, DOI and USDA established the BMTF as an intergovernmental forum for cooperative problem-solving on common issues related to the international border. Its primary mission is to address border security, human safety, and natural and cultural resource protection through shared resources, information, communication, problem-solving, standardization and training. The BMTF is intended to create a positive, intergovernmental working relationship and foster support among agencies charged with border responsibilities. Through this coordination, the task force creates mutually beneficial solutions to resource management issues and provides expertise, experience and information to address common border issues. Additionally, the BMTF provides an opportunity to inform agencies and interested parties about border issues and recommendations for the implementation of possible solutions in the border environment.

Along the southwest border, all USBP sectors have an active BMTF that meets on a regular schedule, with *ad hoc* meetings called as needed. Border 2020 continues to provide an ongoing venue through its task force and regional workgroup meetings to raise new concerns and coordinate with federal, state, tribal and local agencies on border environmental issues, including security-related concerns. In the past, issues such as the waste effects on natural resources and communities resulting from undocumented migrant crossings, and practices to mitigate these effects, were addressed. Border 2020 continues to involve CBP and other agencies in its discussions on environmental issues along the border. Importantly, Border 2020 also involves the participation of Mexican agencies and stakeholders to address environmental issues that cross the border.

Access to federal lands for security purposes should continue to be managed under the terms of the 2006 MOU signed by USDA, DOI and DHS. This guiding document provides a framework for access by USBP and facilitates communication and coordination among the signatories. The MOU has been used in Arizona to allow the USBP to manage use of roads at Organ Pipe Cactus National Monument and Cabeza Prieta National Wildlife Refuge and BLM lands. This arrangement has provided the USBP with the access it requires for border security and also has resulted in the restoration of unneeded roads. DHS and collaborating agencies have been encouraged to provide or seek funding in support of additional restoration of habitats affected by illegal activities and the resulting law enforcement activities. The work at Organ Pipe Cactus National Monument has proven that the overriding need for access to enhance border security can be provided while also restoring and conserving unique and valuable habitats. The case study of road restoration in this report highlights the cooperative effort for ecological restoration in this area of the border.

The GNEB's 10th Report and December 2009 advice letter noted the lack of adequate coordination of security agencies with environmental and land management agencies and other border stakeholders (GNEB 2007, 2009). The PLLA program, the BMTF effort and the Border 2020 process have made significant progress in addressing the Board's concerns. A recent report from the DHS Office of Inspector General did note, however, the need for improved coordination and communication with both internal and external stakeholders (DHS 2017b).

1.3.2 Creating a safer border environment

Protecting U.S. borders from the illegal movement of weapons, drugs, contraband and people, while promoting lawful entry and exit, is an essential mission of DHS. DHS works to manage and make U.S. borders secure through the deployment of personnel, technology and infrastructure. It also works closely with Canada and Mexico as well as federal, state, local and tribal partners in fulfilling its mission. After the 9/11 terrorist attacks of 2001, the deployment of personnel, technology and infrastructure on U.S. borders accelerated. The human and physical resource base built during the past two decades has enabled USBP to develop and implement an enforcement strategy tailored to meet the challenges of securing the border against a variety of threats. Border security has been improved

through increases in USBP staffing, construction of new infrastructure and fencing, use of advanced technology (e.g., sensors, radar, aerial assets), investments to modernize the POEs, and stronger partnerships and information sharing. USBP agent staffing has increased significantly since 9/11. In FY 2001, 9,147 Border Patrol agents were stationed along the border with Mexico; by FY 2007 when GNEB's 10th Report was issued, 13,297 agents were on the Southwest border. By FY 2016, 17,026 agents were on this border, accounting for 86 percent of the total number of Border Patrol agents (CBP 2017b).

Today, USBP's enforcement strategy is threat-based and intelligence-driven. This includes identifying high-risk areas and flows, targeting responses, and deploying resources and capabilities in the most effective manner to achieve multiple security objectives. These include preventing terrorists and terrorist weapons from entering the United States between the POEs, disrupting transnational criminal organizations through targeted enforcement efforts against the highest priority threats and expanding programs that reduce smuggling and crimes associated with smuggling, and managing risk through the introduction and expansion of advanced detection technology along with sophisticated tactics, techniques and procedures. Through enhanced technology, situational awareness, and the introduction and expansion of sophisticated and layered tactics, capabilities and operations, USBP's strategy focuses on "Information, Integration, and Rapid Response."

Information gathered from reconnaissance, community engagement, sign-cutting and tracking, and mobile and fixed technology provides situational intelligence to assess the threats along the border. The use of technology in the border environment is an invaluable force multiplier to increase situational awareness, direct a response team to the best interdiction location, and warn the team of any additional danger that might develop. Information and intelligence help USBP leadership and front line agents to be predictive and proactive and get ahead of the threat. *Integration* denotes CBP planning and execution of border security operations while leveraging partnerships with other federal, state, local, tribal and international organizations. Lastly, *Rapid Response* facilitates the deployment of capabilities efficiently and effectively to mitigate risks. Put simply, rapid response means USBP and its partners can quickly and appropriately respond to changing threats.

Gaps in border security infrastructure in the rugged mountains east of Tecate, California, enable sensitive species that are threatened by habitat loss and fragmentation, such as the mountain lion, to continue to range freely across the border.

Source: Paul Ganster, San Diego State University (September 2017).

A key element of USBP's strategic plan for securing the border is the agency's layered enforcement posture, referred to as "defense-in-depth." This includes advanced detection technology, tactical infrastructure, traditional patrol activities and other enforcement operations. The strategic plan recognizes that the security of the border cannot be achieved by only enforcement activities located at the physical border. For that reason, some of USBP's enforcement operations take place away from the physical border, at interior checkpoints and in ancillary areas. These operational areas away from the border line also require continued and improved mitigation to promote environmental quality and protection in these areas as well.

With more agents, better infrastructure, more powerful technology after the 9/11 attacks, and other external factors, the downward trend in apprehensions of undocumented persons at the southern border has been dramatic. Since FY 2000, apprehensions have dropped by more than two-thirds on the California, Arizona, New Mexico and Texas borders. In the Tucson Sector, apprehensions are down from more than 616,000 in FY 2000 to just 63,397 in FY 2015, a drop of nearly 90 percent. Border wide, FY 2000 had 1.6 million apprehensions; FY 2016 saw only 408,870 apprehensions (CBP 2017c). Increased enforcement and improved security infrastructure at the border with Mexico partially explain the decline in apprehensions as a result of the increased difficulty and cost for migrants seeking to cross the border illegally. Factors such as U.S. and Mexican macro-economic conditions, political instability and gang-related violence in Central America and elsewhere, Mexico's demographic shift, workplace

enforcement actions in the United States, perceptions of unauthorized migrants in U.S. politics, and others also help to explain the sharp decrease in apprehensions at the border with Mexico.

1.3.3 Making travel faster at the border

By expanding trusted-traveler programs that provide expedited movement through POEs into the United States for preapproved, low-risk travelers, CBP has at once improved security and reduced the time and cost for individuals entering the United States. Border residents and frequent border crossers have particularly benefitted from programs such as the Secure Electronic Network for Travelers Rapid Inspection (commonly known as SENTRI), which has reduced the waiting time for northbound crossing at a land POE to 20 minutes or less. Faster processing of vehicles not only reduces inconvenience and costs for travelers but reduces air pollution, with health benefits to people at the POEs and surrounding communities (GNEB 2016). This is another example of meeting security needs at the border and improving the environment and quality of life for border communities.

At a 2016 Border 2020 Air Quality Task Force Meeting in Tubac, Arizona, CBP reported on a pilot project for joint cargo inspections with Mexico at the Mariposa POE to reduce crossing time and emissions that has led to significant improvements. During the proof-of-concept phase of the project, nonperishable northbound cargo that was prescreened was inspected jointly by U.S. and Mexico customs (Galvan 2016). The program reduced crossing times from Mexican warehouses to the United States from an average of 4 to 8 hours to 1.2 hours. This represented a savings of $762,000 in inventory transit costs in just the first 30 days, as determined by the participating industrial sector. The program now is standard at the Mariposa POE and is being considered for expansion to include perishable cargo and rail from prescreened companies and cargo traveling southbound into Mexico. Additionally, it is being considered for implementation at the San Luis and Douglas POEs.

1.3.4 Border security infrastructure

The Board's 10th Report and December 2009 advice letter detailed concerns about the unintended environmental consequences of the hurried-pace construction of border security infrastructure that included primary and secondary fencing, access roads, sensor networks, communications networks, and lighting and video installations (GNEB 2007, 2009). Environmental impacts included altered hydrology in some areas, producing flooding and sedimentation, damage to cultural and natural resources, habitat fragmentation, and barriers

Border security infrastructure near Border Field State Park in San Diego County adjacent to the Pacific Ocean. The infrastructure includes the fence near the boundary, an access road, stadium lighting, a secondary fence and an additional road.

Source: Paul Ganster, San Diego State University.

to migration of endangered or threatened animal species. Increased enforcement activities on dirt roads also had environmental consequences. In some cases, the infrastructure and enforcement activities reduced human pressure on sensitive habitats and species, enabling them to recover. **Appendix 1** reviews the recommendations of the 2007 GNEB 10th Report and federal agency responses to these recommendations. **Appendix 2** reports the recommendations of the December 2009 GNEB advice letter and the progress made toward addressing the highlighted challenges.

1.3.5 Case study: Alternative fencing and collaboration: Buenos Aires National Wildlife Refuge and Organ Pipe Cactus National Monument

In 2004, Organ Pipe Cactus National Monument undertook construction of a vehicle barrier along 30 miles of the south boundary at the Mexico border. The barrier was designed to stop vehicles from driving around the U.S. POEs or USBP checkpoints and through the fragile desert wilderness. Although this 3-year construction project was costly, the natural and cultural resources it has protected are priceless. The effort also had positive effects on visitor and officer safety and national security.

Vehicle barrier on Buenos Aires National Wildlife Refuge. Pronghorn antelope and other threatened species are able to cross the vehicle barrier but not the solid pedestrian fence to the right.

Source: U.S. Fish and Wildlife Service's On the Border: Protecting Natural Resources on the Front Lines of Immigration. www.fws.gov/home/feature/2008/pdf/OntheBorder.pdf

One remaining concern for the FWS and other federal land managers is potential impacts to the endangered Sonoran pronghorn antelope in Arizona as well as other species elsewhere along the border, such as the ocelot in South Texas. The Sonoran pronghorn population was last surveyed in 2016. In southern Arizona, there now are an estimated 273 animals. An additional 90 animals have been released through a captive rearing program in Nevada. In recent years, captive propagation and better habitat conditions have resulted in a substantial increase in the population from a drought-induced population collapse in the early years of the 21st century. Sonoran pronghorn are especially sensitive to fencing, preferring to crawl under barbed wire fences rather than jump over, and human disturbance, including unauthorized migrants and smuggling activities and border patrol activities. The migration of Sonoran pronghorn to populations across the border also is important for the recovery and health of the species (FWS 2015).

This steel fence is designed to stop car and truck traffic that used to drive from Mexico, through the wilderness of Organ Pipe Cactus National Monument, to enter into the United States illegally. This type of barrier does not impede wildlife following traditional migration corridors.

Source: NPS. www.nps.gov/orpi/planyourvisit/barrier.htm

In 2008, FWS worked with CBP in the design of fence segments to incorporate wildlife passage elements. For other segments, CBP committed to mitigation measures for the fences' effects on listed species.

1.4 In closing

Although 10 years have passed since GNEB issued its 10th Report, the southwest border environment and socioeconomic context are dynamic and require continual adaptation of policies and actions to respond to emerging challenges and changing conditions. The fragile natural environment of the border region underscores the need for careful planning and coordination among federal agencies to mitigate the impacts as border security infrastructure is built out and enforcement activities intensify. Advance planning, coordination and stakeholder participation will improve security infrastructure and facilitate meeting both security and environmental goals. This will help to avoid mistakes and the resulting need to make expensive adjustments to infrastructure along the border.

CHAPTER 2
Challenges and Opportunities
Part I

The intersection of border security and the environment impose a number of challenges and opportunities on the border region. Areas of emphasis in this report include:

- Ecosystems, tourism and outdoor recreation.
- Plant and animal life and habitat integrity, including the intersection of invasive species and border security, endangered species along the border, and the potential environmental impacts of and alternatives to the border wall.
- Emergency response and preparedness, including hazmat.
- Water management, flooding, and trash and sediment control.

The shape and form of security infrastructure installed along the border is a critical factor affecting these areas of special concern as well as air quality. Also of importance are management practices by security agencies. Additional installation of security infrastructure along the border will have a significant effect on the region, presenting both challenges and opportunities to enhance security while preserving or even improving environmental sustainability. Installation of new walls, fencing and support infrastructure along the border could be an enormous undertaking. In some areas, the infrastructure could be the equivalent of construction of a highway through similar terrain. Given the scale and cost of the program to enhance border security infrastructure, it is important to get it right the first time, avoiding costly mistakes and even more costly corrective actions. This requires careful planning and advanced coordination with stakeholders in the region.

2.1 Ecosystems, ecotourism and outdoor recreation

Natural ecosystems are the foundation of many life-sustaining and life-enhancing benefits (or services)—clean air and water, fertile soil for crop production, pollination, recreation, flood control and others. Ecosystem services are critical to economic development and sustainability as well as environmental health but often are undervalued, taken for granted or ignored. Collaborative ecosystem management efforts are especially effective in avoiding costly environmental and health remediation efforts that can occur from a dysfunctional system. Two case studies—the Tijuana River National Estuarine Research Reserve (TRNERR) and the Buenos Aires National Wildlife Refuge—highlight lessons learned. These case studies serve as models for achieving both improved border security and environmental quality.

It is evident from past successes that collaboration among DHS and other federal and state agencies with conservation research and management groups leads to mutually beneficial solutions that both enhance border security and support wildlife corridors, estuary health and environmental health, leading to species protection and ecotourism benefits. Together, ecotour-

ism and outdoor recreation are a substantial part of the U.S. economy and of the border region. As indicated in Figures 1 and 2 in the Introduction, large areas of the border are protected areas, especially in California, New Mexico and Arizona and to a lesser extent in Texas. These protected areas are important resources for ecotourism and outdoor recreation, including birding, hiking, camping, mountain biking and so forth. In addition to the federally protected areas, important state and local parks and wildlife management areas provide further opportunities for the public and for the protection of vital habitats and species.

Although the value of ecotourism in the border area is difficult to quantify, the Texas Parks and Wildlife Department has collected information that helps to explain economic benefits of wildlife-related tourism. Millions of Texas residents travel to observe, photograph or feed wildlife; these travelers spent $228,779,736 on travel-related expenses in 2001. Additionally, wildlife-watching activities support more than 23,000 jobs in Texas. More than $80 million was generated from state sales tax on purchases by wildlife watchers. FWS and the U.S. Census Bureau reported that, in 2011, wildlife watchers spent $1.8 billion on wildlife-watching activities in Texas (**Figure 8**) (FWS and U.S. Census Bureau 2013). Wildlife-watching equipment (binoculars, special clothing, etc.) expenditures totaled $590 million, and away-from-home wildlife watchers on average each spent $463 on trip-related expenditures (FWS and U.S. Census Bureau, 2013). Not only does wildlife-watching support jobs and bring in ecotourism dollars, tourism is the third largest industry in Texas, and nature-based tourism is one of its fastest growing segments. "Nature-related tourism offers Texans the opportunity to build and diversify economies based on conserving the natural resources and rural lifestyles important today and for future generations" (Texas Parks & Wildlife 2017).

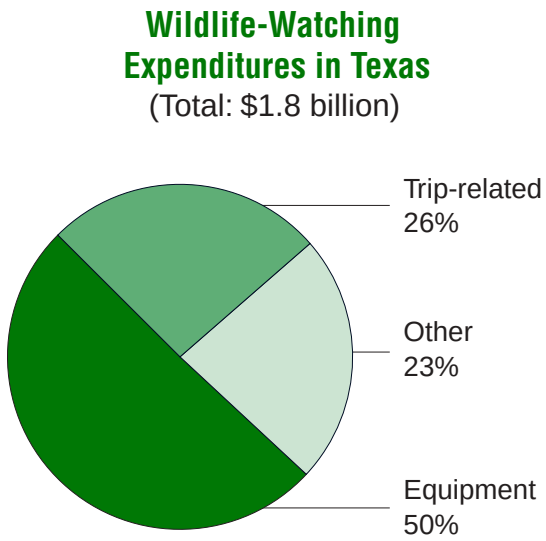


Figure 8. Wildlife-watching expenditures in Texas.
Source: FWS and U.S. Census Bureau (2013).

Important birding areas are found throughout the border region. These include, among others, the Tijuana River Estuary and the Colorado River and Salton Sea in California; the San Pedro River National Conservation Area in Arizona; and the Santa Ana National Wildlife Refuge, Las Palomas Wildlife Management Area, and Laguna Atascosa in Texas. These generate a large number of visitors with positive effects on the local economies. In addition to these federal lands that help provide important habitat for birds and birding opportunities, state and local parks along the border also provide protected areas and opportunities for wildlife watching. In Texas, the World Birding Center, the Sabal Palm Sanctuary, and Big Bend Ranch State Park all could be significantly affected by the construction of a physical wall.

Security infrastructure and enforcement actions have negatively affected border ecotourism through the building of fences and roads and restricting access to some areas. Alternatively, in many protected areas along the border, improved security has helped protect ecosystems from damage by migrants and smugglers, as well as from the enforcement activities, and has made these areas once again safe and accessible for ecotourism and outdoor recreation. A good example

Warning sign in Coronado National Forest in southern Arizona, near the international border, circa 2006. By 2017, increased border security made the national forest safe for recreation once again.

Source: Paul Ganster, San Diego State University.

of this is the reopening of the areas adjacent to the international border in Organ Pipe Cactus National Monument, including the famed Quitobaquito Springs. This part of the national monument had been closed for a number of years because of a lack of security for monument personnel and visitors. Another example of benefits of increased border security is the Coronado National Forest along the border in southern Arizona. In 2007, at the time that GNEB's 10th Report was issued, warning signs were posted to alert recreationists of the dangers from unauthorized border crossers. By 2017, these border areas of the Coronado National Forest were safe for people to enjoy.

As seen along the border of Tijuana, Mexico, and Imperial Beach, California, collaboration among USBP, land and resource management agencies, and conservation organizations have many benefits. When Border Patrol agents understand the positive impact and delicate balance required for effective ecosystem management, and when resource managers understand the intricate elements of border security, the results can mean a healthier environment, a safer border and economic advantage. According to Linnell et al. (2016), "Including border security personnel in wildlife monitoring is one critical step to raise awareness of wildlife needs, help assess the impact of border fences, and explore potential strategies for reducing the unintended impacts on wildlife." Furthermore, through this collaboration, all parties can achieve a better understanding of where additional options for enhancing border security that also support natural system functions can work together. For instance, high-tech monitoring methods in unfenced areas could provide effective security while allowing for wildlife corridors to remain intact. An improved ability to manage natural resources and lands from border patrol activities also can be seen along high-traffic areas for illegal immigration, such as the Tijuana border area. Natural resource management personnel have increased security in their daily activities, and the effects from illegal camping and hiking off trails have been reduced.

2.2 Intersection of invasive species and border security

The Board has commented on the persistent problem of invasive species affecting natural systems along the border, especially aquatic areas and the banks of the Rio Grande and Colorado River (GNEB 2004). The dense vegetation produced by some invasive species presents problems for border security enforcement by restricting USBP access and screening smugglers and illicit activities from observation.

Giant cane or Carrizo cane (*Arundo donax*), a species from the Middle East brought to the United States in the 19th century, now has taken over many water bodies. Along the Rio Grande, it grows in dense stands, sometimes acres in size, allowing undocumented migrants and drug smugglers to hide and evade USBP agents (**Figure 9**). Remote video surveillance cameras cannot penetrate the thickets, enabling smugglers to cross the Rio Grande and approach agents virtually undetected (DHS 2007).

Figure 9. Border Patrol Agent Jose Perales wades his way through the Carrizo cane along the Texas-Mexico border.
Source: Reynaldo Leanos, Jr., *Texas Standard*. www.texasstandard.org/stories/this-invasive-species-is-a-threat-to-national-security

The giant cane can grow rapidly up to 18 feet in height. A predatory wasp was introduced to help eliminate the cane, but more usual control methods are cutting, burning and application of herbicides. A binational group, Los Diablos (The Devils), burns the cane along the Rio Grande in Big Band National Park (Fernandez 2016). Composed of firefighters, conservationists and park rangers, the group uses prescribed burns followed by application of an herbicide to guarantee that reproduction is halted.

Salt cedar (*Tamarix ramosissima*) is another invasive species that has spread throughout the border. This species causes problems similar to the giant cane, outcompeting native vegetation, frustrating border security activities, affecting river flows important to complying with minimum amounts of water specified in binational water treaties, and limiting access to the riparian areas by local communities. Along the portion

of the lower Colorado River that forms the U.S.-Mexico border, the Fort Yuma Quechan Indian Tribe manages a Bureau of Indian Affairs Noxious Weed Program that is used to clear and eradicate salt cedar. The tribe also manages a USDA Natural Resource Conservation Service Environmental Quality Incentive Program, which is used to replant areas cleared of salt cedar along the Colorado River with native vegetation like mesquite (*Prosopis* spp.), cottonwood (*Populus* spp.) and willow (*Salix* spp.) trees (Fort Yuma Quechan Indian Tribe 2017). The tribe and its partners have not only restored access to the river to tribal members but have restored native vegetation and improved access for security purposes.

2.3 Endangered species along the border

The U.S.-Mexico border region is a delicate ecosystem with regular animal and bird migrations moving between the north and south of the North American continent across the international border. It is home to a diverse population of mammals, birds and plants. The dry, desert ecosystem also supports pronghorn antelope, cougars, desert bighorn sheep (*Ovis canadensis nelsoni*), the endangered North American jaguar, and the ocelot—which is down to its last 50 animals in southern Texas (Sullivan 2016). The U.S.-Mexico border region has the highest rate of species endangerment in the United States (Van Schoik 2004). Some 31 percent of the species listed as endangered by DOI are found in the region. On the Mexican side of the border, 85 species of plants and animals are endangered. Not surprisingly, the threats to these species are exacerbated by the fact that the ecosystems in this region are split by a political boundary that greatly complicates conservation efforts as well as creates a physical barrier that fragments habitat and impedes migration of animals. The border wall bisects public and private lands along the border, and the barrier can affect the 30 endangered, threatened or candidate species of wildlife that live near the international border in just Arizona and Sonora (Cohn 2007; Gaskill 2016).

Other areas of the border experience similar issues with respect to border infrastructure. Because of the necessary roads, vehicles and support facilities that come with border security, some fragile desert plants (including saguaros [*Carnegiea gigantean*]) and other wildlife species (including Sonoran pronghorn antelope) may lose access to important sources of food and water (Cohn 2007). Retaining migration corridors via connected habitat across the international border for endangered and important species is critical. Maintaining connected habitats across the international boundary is especially important for species struggling to survive in the face of multiple and cumulative threats. Three border regions—California, the Madrean archipelago and the Gulf Coast—are of particular concern. These regions are characterized by high overall species richness and high richness of species at risk from existing barriers and construction of potential new barriers. For some species, existing sections of the border wall have completely blocked the migration corridors—or regularly traveled paths through the landscape—in areas that species have relied on for centuries. New sections of the wall may have the same effect depending on how they are designed and where they are constructed (Lasky et al. 2011). Imperiled and endangered species—which include, among others, the ocelot, jaguar, bighorn sheep, cougar, long-nose bat and Sonoran pronghorn antelope—"may not be able to migrate, exchange genes between populations necessary for a healthy population, and/or reach vital food" or water sources (Esquina 2017). A recent study by leading scientists estimates that completion of the wall as presently conceived as a barrier impenetrable to humans and wildlife would affect some 800 species, 140 of which are in danger of extinction (Baverstock 2017; Ceballos and Pacheco 2017; Kolef et al. 2017).

2.4 Potential environmental impacts and alternatives of the proposed border wall

The U.S. government has constructed 654 miles of primary fencing (pedestrian and vehicle fence) and an additional 51 miles of secondary fence covering approximately 36 percent of the border. Other parts of the border have high mountainous terrain or major rivers, such as the Rio Grande, that act as natural barriers. The current administration has proposed extending the structure to cover the entire border. In March 2017, CBP issued two formal requests for proposals (RFPs) that specified the physical requirements for the proposed wall: 18–30 feet in height, made of solid concrete or other materials, possess an anti-climb top and below-ground barrier to prohibit digging beneath it, must withstand 1 hour of hammering and chiseling, contain pedestrian and vehicle gates (25 and 50 feet wide, respectively), contain fittings on the U.S. face to "shield from external attack," and include attractive

A variety of species, including those presented in this image, could be affected by the construction of a border wall.

Source: The Scientific Consulting Group, Inc. for GNEB.

texture and color on the U.S. side. Companies that submitted proposals were expected to construct a physical prototype of their proposal (CBP 2017d).

Federal law provides the DHS Secretary with the authority to waive federal, state and local environmental law if deemed necessary for border security. As of 2011, the DHS Secretary had applied waivers of more than 50 environmental laws. Waivers also were applied to more than 550 miles of barriers and roads needed to complete border fencing projects (Neeley 2011). If new security infrastructure is to be built, federal agencies must continue to collaborate to ensure that infrastructure is designed and sited to mitigate the effects on the environment, plant and animal species, and their habitat. This collaborative approach will help to ensure that the infrastructure is completed properly and will not have to be reconfigured to address flooding or other issues. This is the most cost-effective approach.

No comprehensive border-wide studies of the existing fence's effects on wildlife and plant species have been conducted. Scientific studies conducted in specific border locations and published in peer-reviewed science journals, however, provide important information on the effects of fencing on wildlife in parts of the border region. A 2010 biological analysis found that nine herds of bighorn sheep in Mexico are linked to herds in Arizona, and proposed fencing would isolate some herds on the Arizona side as a result of the limited mobility range of female bighorn sheep. The same study found that endangered ferruginous pygmy owls

(*Glaucidium brasilianum*) would be affected by the large vegetation gaps and tall fences created by proposed fencing because of the birds' limited range and flight height. Overall, the study found that other species that have similar mobility and spatial distributions may be affected by border development, yet mitigation strategies could be designed to address both wildlife and societal needs (Flesch et al. 2010). Other species identified by biologists and other scientists as affected by the fencing proposal in 2007 include the Sonoran pronghorn, jaguar and ocelot. A wall would prevent jaguars from repopulating the southwestern United States from a population in Mexico's Sierra Madre Occidental. Landscape permeability to allow wildlife movement is critical to wildlife health and survival (Cohn 2007).

In southern San Diego County, the border fence now ends on a steep western slope of mountains to the east of the small town of Jacumba and does not begin again until the desert floor of Imperial County. The intervening mountains are part of the range of the desert bighorn sheep that inhabit the Peninsular Ranges in southern California from the San Jacinto Mountains south across the border and through Baja California to Volcán de Tres Vírgenes in Baja California Sur, Mexico (Bighorn Institute 2017; FWS 2000). Peninsular bighorn sheep are a natural part of the California border's heritage and culturally and economically important. Completing an impenetrable fence across its migration corridor would further endanger this species.

Jacumba, California, where existing fence ends, not intruding on the migration corridor for peninsular desert bighorn sheep, mountain lion and other species.

Source: Paul Ganster, San Diego State University.

Flooding impacts on habitat and the landscape have been associated with existing border fencing, including a pedestrian barrier in Organ Pipe Cactus National Monument that impounded floodwaters after a heavy storm event in July 2008 (Neeley 2011; NPS 2008). Analysis has indicated that the border barriers likely contributed to a flooding event in Nogales, Sonora, in July 2008, possibly implicated in two drowning deaths (Clarke 2016); this will be discussed in more detail in Section 3.3.3 of the report. Landscape disruption in the rugged Otay Mountain Wilderness in San Diego County through fence and access road construction produced accelerated erosion in areas with the rare Tecate cypress (*Cupressus forbesii*) and the imperiled Thorne's

Border fence near Jacumba in eastern San Diego County. The image from 2002 (above) shows the 8-foot fence constructed from surplus landing mats and then a vehicle barrier in the valley bottom. The 2017 image (below) shows how the vehicle barrier was replaced with a pedestrian fence approximately 20 feet in height that also includes gates that open to accommodate stormwater flow and decrease flooding impacts.

Source: Paul Ganster, San Diego State University.

Surveillance equipment and communications along the border fence separating the United States and Mexico at Nogales, Arizona.
Source: Rex Wholster/Shutterstock.com.

hairstreak butterfly (*Callophrys [Mitoura] gryneus thornei*) that relies on the cypress as a host (Neeley 2011), although no occurrences of removal or destruction of protected species have been documented. Subsequent to the reported incidents, CBP undertook a review of fence design and made modifications where needed and improved the removal of debris collected along fences. There have been no recent reports of issues related to border security fences. In Starr County, Texas, on the Lower Rio Grande, recent proposals for barrier construction have raised strong local concerns (Schwartz 2017). Elected officials and community members have raised specific issues with new wall construction, including heightened flooding risk, isolation of parts of the communities or private lands on the south side of the new structure, and major impacts on habitat and birding areas, especially Roma Bluffs.

In view of these impacts of border security infrastructure installation on the environment, wildlife and landscape, it is imperative for federal agencies such as DHS and CBP to continue to collaborate on environmental mitigation to the maximum extent feasible in future border security infrastructure projects. GNEB recommends that environmentally sustainable infrastructure design be considered in future projects. The negative environmental impacts produced by previous fence and access road construction should inform the current efforts of 2017 and any future efforts to extend and enhance border infrastructure. Careful planning and collaboration with other federal agencies and state and local stakeholders will help DHS to avoid past shortcomings and produce border barriers that meet the needs of security and environmental protection. For example, through working with land managers of protected areas and biologists, DHS could determine locations where cross-border habitat must be undisturbed to facilitate migration and survival of sensitive species. A combination of vehicle barriers, gates, sensors, presence of USBP personnel, close cooperation with Mexican authorities, and other methods could secure these areas from unwanted human intrusion yet enable animal movement to take place. To this end, GNEB reiterates its recommendation from the 10th Report:

> *"As a best business practice, hold a national conference on fencing/barrier technology that highlights successes to date and educates the public, with participation from private sector experts and nongovernmental organizations. As an outcome, develop recommendations for prototype fences that meet security goals while minimizing environmental damage or even improve environmental conditions" (GNEB 2007).*

The 2017 CBP RFPs for border wall construction proposals produced innovative thinking on border wall designs and solutions. At least two proposals for more "sustainable" alternative border barriers represent the types of proposals that have emerged. One defense contractor developed a proposal for a virtual border

Security personnel watching a video monitoring surveillance security system.

Source: Dmitry Kalinovsky/Shutterstock.com.

barrier that uses computer technology and thousands of portable sensors as an alternative to a concrete brick-and-mortar wall. The proposed virtual wall would be less costly than a brick-and-mortar equivalent. This proposal employs sophisticated prototype infrared sensors the size of a softball (4 inches in diameter and 5.5 inches high) that are powered by solar batteries and can sense motion, infrared light, heat and other evidence of human activity nearby. The portable sensors would be distributed via dropping an estimated 200 sensors per mile of border area from an aircraft in an "asymmetrical grid pattern" and scattered in a band extending 0.5 mile into the United States from the border. The sensors would activate on impact and begin communicating with adjacent nodes and sending data regarding detected activity to regional cluster nodes with a signal similar to Bluetooth, not requiring Wi-Fi or satellite connection. The cluster nodes, which are a bit larger because of their increased power need and requisitely larger solar panel, then would relay the information through an encrypted wireless signal to the sensor network monitoring server. Information from sensors can be tracked on computers or devices such as tablets and smartphones via a Web browser; color-coded alerts would be sent to tracking devices if human activity is detected (Dickson 2017). No comparable system currently exists to assess if such a system could meet the security requirements of the RFP.

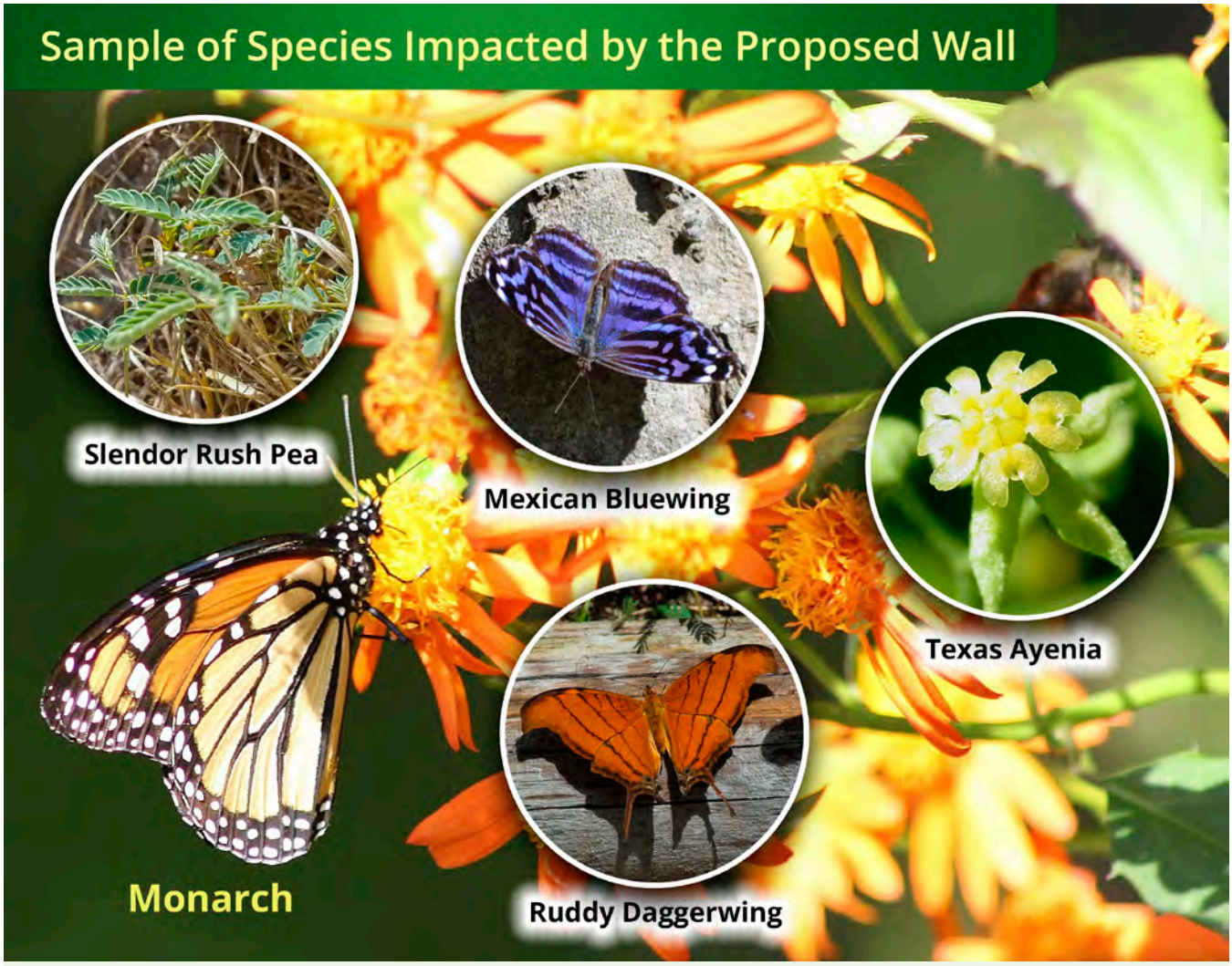
A second alternative concept first proposed by Mexican environmentalists is a solar border structure that would generate enough electricity to power one-half-million U.S. homes and would "pay for itself" (Fthenakis and Zweibel 2017). This alternative would be a "massive string" of horizontal photovoltaic panels that could provide an equivalent barrier to that associated with a concrete wall. The solar structure could be managed by a public-private partnership that could generate economic development in the border region. A Nevada company has developed a similar proposal (Yeo 2017). Despite the obvious practical obstacles, the solar alternative may represent a sustainable and more economical alternative to the concrete wall described in the RFP.

These are just two of many alternatives that have emerged in 2017. It is apparent that, through collaboration with the private sector and other stakeholders, innovative solutions can be developed for border security infrastructure. Existing practices, such as leaving gaps to provide access for agricultural fields along the Rio Grande and Rio Colorado that were isolated by border fence construction, can be adapted to permit wildlife migration with proper USBP supervision. These solutions can address both security and environmental needs along the border with Mexico.

2.4.1 Case study: The National Butterfly Center (NBC) in Mission, Texas

The NBC is a 100-acre botanical garden, featuring formal demonstration beds and wildscape, focused on native host and nectar plants that sustain all life stages of more than 200 species of butterflies. Once a commercial onion field, this parcel of land that borders the Rio Grande and is bisected by the Mission Main Canal and levee, now serves as a preserve for disappearing riverine woodland and wetland and acts as a refuge for three federally listed endangered plant species—slender rushpea (*Hoffmannseggia tenella*), Tamaulipan kidneypetal (*Ayenia limitaris*) and Walker's manioc (*Manihot walkerae*). Other species of interest at NBC include the threatened Texas tortoise *(Gopherus berlandieri*), Texas horned lizard (*Phrynosoma cornutum*) and the Texas indigo snake (*Drymarchon melanurus erebennus*).

Less than five percent of native habitat remains in the Lower Rio Grande Valley, and it is primarily set aside along the Rio Grande, in the Lower Rio Grande Valley Wildlife Conservation Corridor. This corridor is a multistakeholder effort to connect lands from Falcon Dam to the Laguna Madre to create a contiguous range for wildlife to feed and breed. Projects like the NBC play a critical role in the conservation corridor by preserving remnants of land for native plant and wildlife species



The National Butterfly Center helps to preserve land for native plant and butterfly species, such as these, which could be negatively affected by construction of a border wall on the property.

Source: The Scientific Consulting Group, Inc. for GNEB.

in this subtropical zone, where western desert meets thorny shrubland and the South Texas prairie.

The Lower Rio Grande Valley is home to 1,200 plant species, 300 butterfly species and 700 vertebrate species, of which 530 are birds. The greatest conservation challenges to this area are land development, the availability of water, erosion management, increases in nonnative pasture for livestock at the expense of native grassland, and habitat fragmentation.

According to the U.S. Geological Survey, "native habitats in the Lower Rio Grande Valley, particularly in the riparian corridor, remain small and fragmented—even more so with construction and completion of the border fence" (Leslie 2016). Similarly, The Nature Conservancy notes stresses, including habitat disturbance and destruction, as peculiarly detrimental to the landscape and survival of wildlife, as hundreds of acres of native plants are eliminated for CBP's barren "control zone." The movement of terrestrial life, especially, is restricted by unnatural barriers (The Nature Conservancy 2008). Not only does the border wall impose an artificial division on the southwestern borderlands, once united by the Rio Grande, it now poses a threat to wildlife that will not be able to reach the river or range beyond the wall. The wall also will disrupt the natural seed distribution of native plants provided by wind and wildlife and exacerbate the spread of plants that do not depend on consumption to proliferate. Construction of a border wall also presents a challenge to the thriving ecotourism economic activity of the NBC and the Lower Rio Grande Valley. Declines in ecotourism, an economic

activity that generates more than $450 million annually for the Lower Rio Grande Valley, occurred where portions of a border wall already have been constructed (Woosnam et al. 2011).

The NBC has spent the past 15 years working to reverse habitat loss through the deliberate planting of native host and nectar plants for wild, free-flying butterflies, all of which face increasing pressure to survive as a result of climate change, drought, disease and development. Most recently, the NBC became home to the Southernmost Monarch Waystation and is planting 10,000 native milkweeds (*Asclepias* spp.) and spring and fall nectar plants to sustain imperiled monarchs (*Danaus plexippus*) during seasonal migrations and provide ecologically appropriate host plants to support a rebound in species numbers.

Just as the topography of border mountain ranges presents challenges to the installation of border security infrastructure (i.e., fences and access roads) in a way that minimizes negative environmental impacts, the Lower Rio Grande Valley also presents significant challenges. The Rio Grande meanders through the landscape, and the adjacent river bottom is generally not suitable for fence construction as a result of periodic flooding. The Treaty of November 23, 1970, also prohibits construction of "works…which…may cause deflection or obstruction of the normal flow of the river or of its flood flow" (IBWC 1970). Given that the current design of fences is not suitable for the flood plain, USBP has placed the fence and support roads on higher ground on the river's levee, which often is some distance from the international boundary located in the center of the river. In the case of the NBC, USBP has proposed locating the fence along the levee, which is approximately 900 yards from the banks of the Rio Grande. In addition to installation of an impenetrable barrier, this security project would remove vegetation from a 150-foot wide control zone. These actions would fragment the habitat in an important link of the Lower Rio Grande Valley wildlife corridor and would impair the functioning of the NBC. More than half of the NBC's land would be located south of the fence. Figure 10 shows the location of the NBC and proposed border fence.

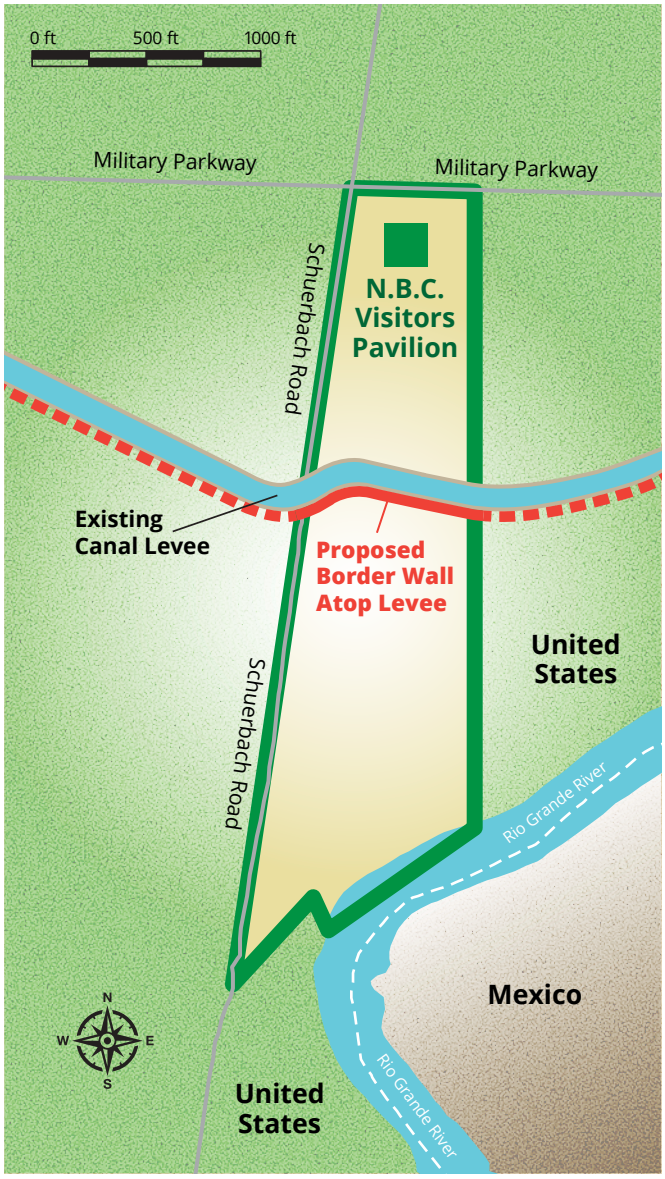


Figure 10. Map of the National Butterfly Center and proposed border fence.
Source: The Scientific Consulting Group, Inc. for GNEB.

2.5 In closing

The Board urges all appropriate federal government departments and agencies to coordinate closely with state, local, municipal and tribal governments and local property owners who would be affected by additional fencing. Starr and Hidalgo Counties in Texas are emblematic examples of the problems and complexities associated with adding sections of fencing along the border. Concerns regarding flooding that could result from additional infrastructure along that section of the border have been raised continually during the past decade. Unless it is carefully planned and designed, additional infrastructure in that section of the border, particularly within the Santa Ana National Wildlife Refuge, could have extremely damaging and likely irreversible ecological and economic effects.

CHAPTER 3
Challenges and Opportunities
Part II

3.1 Emergency response and preparedness

A critical element related to border security as well as to sustainability and resilience of border communities is emergency response. There is a strong foundation of hazmat and emergency response preparation and planning along and across the border, capacity that can support security efforts in the region. This section describes how the U.S. and Mexico governments manage transboundary emergency response, including agreements, non-binding documents and standard operating procedures at the federal, state and local levels. This section relies on three documents: a 1980 agreement between the U.S. and Mexico updated in 2008 (U.S. Department of State 2008), a U.S. Department of State 2013 report on transboundary emergency procedures (U.S. Department of State 2013), and a 2004 scholarly report (Batchelor 2004). The sister city plans (USEPA 2017), central to the contingency plans along the border, also are discussed.

The 1980 agreement (updated in 2008) on emergency management in case of natural disasters or accidents provides a framework for U.S.-Mexico cooperation among nine U.S. and 14 Mexican agencies in a natural disaster, accident or other emergency, including security-related incidents (U.S. Department of State 2008). Table 1 lists mandated topics of U.S.-Mexico cooperation (U.S. Department of State 2008). This agreement authorizes participation of nongovernmental organizations or businesses and coordination with state, local and other authorities. The agreement asks each country to use best efforts to facilitate prompt entry into and exit from its territory of personnel and recognizes that cooperation is limited to actions authorized by domestic laws and the availability of funds.

Table 1. The U.S.-Mexico Emergency Cooperation Agreement

- **Exchange of information, experts and technicians as mutually agreed.**
- **Exchange of information on techniques for evacuation of persons under emergency conditions.**
- **Exchange of information on techniques to ensure an adequate supply of resources necessary to meet emergency situations.**
- **Assessment of emergency communications planning.**
- **Analysis of the probable effects and potential risks of particular kinds of disaster in geographic areas having a high potential for risk.**
- **Promotion of symposia, conferences, workshops and training programs in emergency management and response.**
- **Cooperation with other international, governmental or public and private nongovernmental entities involved in emergency management.**
- **Other activities, as mutually recommended by the U.S. Departments of State and Homeland Security and Mexican ministries of Foreign Affairs and Governance.**

Source: U.S. Department of State (2008).

If an environmental incident should occur along the U.S.-Mexico border, local governments will respond initially and provide emergency response capability prior to either federal or state agency responses. Local governments usually concentrate emergency response and planning into a few agencies that address fire, police, emergency medical services or emergency response. Local governments also deal with private companies that haul hazmat. In the event of an incident, these companies may have first responder capability and, if so, local governments can integrate public sector responses with private sector capabilities.

For many border communities, the fire department is the principal agency for emergency response because those units typically prevent and control fires and respond to hazmat incidents. In many communities, fire departments also deliver basic emergency medical services (EMS) and general emergency response. In some communities, EMS and emergency management departments may be separate. If an office of emergency management (OEM) exists, it may address contingency planning and integration of departmental standard operating procedures. The OEM fulfills state and federal government legal requirements for each city to have a single point of contact for emergency management to create coordination among different jurisdictions.[4] For example, an OEM in one city may negotiate with neighboring cities and counties, or even across the U.S.-Mexico border, to institute mutual aid agreements. The capabilities and organizational structure of fire departments vary from city to city.

Decontamination for emergency response at an oil refinery plant.
Source: Phonix_a Pk. sarote/Shutterstock.com.

Local emergency personnel respond to incidents regardless of the nature or cause of the problem. As emergency causes vary, emergency planning efforts focus on dealing with the common effects (Texas Department of Public Safety 2017). For example, fires and floods both can force people from their homes, so emergency plans focus on evacuation. Emergency plans identify key functions and assign responsibility for carrying out the tasks necessary to complete them. Typically, the organization or unit tasked with a function develops a standard operating procedure to ensure critical tasks are completed, an "all-hazards" approach so emergency response personnel can respond to any situation. Eight common functions necessary for local emergency response operations as identified by the Federal Emergency Management Agency (FEMA) are listed in Table 2 (FEMA 2013).

Table 2. Emergency Management Core Facilities

- **Direction, Control and Coordination**
- **Communications**
- **Warning**
- **External Affairs/Emergency Public Information**
- **Population Protection**
- **Mass Care, Emergency Assistance, Housing and Human Services**
- **Public Health and Medical Services**
- **Logistics Management and Resource Support**

Source: FEMA (2013).

On the U.S.-Mexico border, many U.S. cities have signed mutual aid agreements with their Mexican counterparts, sometimes called sister city plans. Currently, 15 sister city plans are in place, listed in Table 3. These agreements include specific guidance for responding to emergency situations, including accidental leaks or hazmat spills, and are being updated to account for emergency situations caused by natural disasters. Although there have been instances of cross-border notification and response to emergency situations at the municipal level, the Joint Contingency Plan has not been activated since it was signed and implemented in 1999 (Oliveira 2017). Informal binational cooperation often occurs, as documented in *Natural Disasters and the Environment Along the U.S.-Mexico Border: Eleventh Report of the Good Neighbor Environmental Board to the President and Congress of the United States* (GNEB 2008).

[4] Texas Government Code: *Texas Disaster Act of 1975. Title 4, Subtitle B, Chapter 418, Subchapter A § 418.101.*

Table 3. Current Cross-Border Contingency Plans for U.S.-Mexico Sister Cities

EPA Region	Sister Cities	Adoption Date
6	Columbus, New Mexico–Puerto Palomas, Chihuahua	2002
6	El Paso, Texas–Ciudad Juárez, Chihuahua –Sunland Park, NM–Ysleta del Sur Pueblo	2007, updated 2009
6	Del Rio, Texas–Ojinaga, Chihuahua	2004, updated 2013
6	Del Rio, Texas–Ciudad Acuña, Coahuila	2001, updated 2013
6	Eagle Pass, Texas–Piedras Negras, Chihuahua	1998, updated 2013
6	Laredo, Texas–Nuevo Laredo, Tamaulipas	1998, updated 2016
6	McAllen, Texas–Reynosa, Tamaulipas	2000, updated 2009
6	Pharr, Mission, Hidalgo, Edinburg, Weslaco, Donna, Texas; and Río Bravo, Tamaulipas, added to McAllen–Reynosa agreement	2009
6	Brownsville, Texas –Matamoros, Tamaulipas	2002, updated 2016
6	Harlingen, Texas and Valle Hermoso, Tamaulipas, added to Brownsville–Matamoros agreement	2016
9	San Diego, California–Tijuana, Baja California	2013 updated
9	Calexico (Imperial County), California–Mexicali, Baja California	2005, update pending
9	Yuma and San Luis, Arizona–San Luis Río Colorado, Sonora	2000, update pending
9	Nogales, Arizona–Nogales, Sonora	2005, update pending
9	Naco (Cochise County), Arizona–Naco, Sonora	2002, update pending
9	Douglas, Arizona–Agua Prieta, Sonora	2011, update pending
9	Tohono O'Odham Nation, Arizona–Sonoyta, Sonora	pending

Source: USEPA (2017).

These cases include the April 2004 flooding of the Río Escondido in Piedras Negras, in which case the mayor of the Mexican border town requested assistance directly from CBP, and also severe thunderstorms in April 2007, during which the Mexican state of Coahuila and the city of Piedras Negras assisted with clean-up efforts in Eagle Pass and Maverick County, Texas. These cross-border linkages for emergency response form a basic component of border security.

State governments are intermediaries in contingency planning and emergency response. The federal government sets priorities and develops national plans. Local governments respond to incidents. State governments enact federal priorities and support local governments in their response efforts. When an emergency exceeds the response capability of local governments, state agencies may become involved in directing and coordinating state response. Disaster preparedness and mitigation activities can be ongoing at any time. Response and recovery activities generally require the declaration of a state of disaster. A governor may declare a state of disaster for a particular area if a disaster has occurred or is imminent. In Texas, for instance, once the governor declares a state of disaster, the appropriate designated agency institutes the appropriate sections of the state emergency management plan and other necessary actions to deal with the situation.[5]

For example, in Texas, the Texas Emergency Management Executive Guide assigns responsibilities to seven executive branch state agencies and two services operated by the Texas A&M University System (Table 4) (Texas Department of Public Safety 2017). The Texas Division of Emergency Management in the Department of Public Safety is the primary Texas agency for contingency planning, response and mitigation. Once the governor declares a state of disaster, the Texas Division of Emergency Management may institute the appropriate sections of the state emergency management plan and other necessary actions to deal with the situation. Under Texas law, the governor and his or her duly appointed advisors have considerable powers in implementing any response

[5] Texas Government Code: *Texas Disaster Act of 1975. Title 4, Subtitle B, Chapter 418, Subchapter A § 418.101.*

Table 4. Emergency Support Functions (ESF) and Lead Agencies in Texas

ESF #	Focus	Lead Agency
1	Transportation	Texas Department of Transportation
2	Communications	Texas Department of Public Safety
3	Public Works and Engineering	Texas Department of Transportation
4	Fire Fighting	Texas A&M Forest Service
5	Emergency Management	Texas Division of Emergency Management
6	Mass Care, Emergency Assistance, Housing and Human Services	Texas Division of Emergency Management
7	Logistics Management and Resource Support	Texas Division of Emergency Management
8	Public Health and Medical Services	Texas Department of State Health Services
9	Search and Rescue	Texas A&M Engineering Extension Service
10	Oil and Hazardous Materials Response	Texas Commission on Environmental Quality
11	Agriculture and Natural Resources	Texas Department of Agriculture
12	Energy	Public Utility Commission of Texas
13	Public Safety and Security	Texas Department of Public Safety
15	External Affairs	Texas Department of Public Safety

Note: ESF has been superseded in accordance with the National Disaster Recovery Network.

Source: Texas Department of Public Safety (2017).

strategy. These options range from the use of public and private resources to the suspension of procedural rules and laws to the forced movement of people. The disaster proclamation must specifically state the nature of the threat and the emergency, and a state of disaster cannot last longer than 30 days unless extended, the threat or danger has passed, or until the conditions no longer exist (Texas Department of Public Safety 2017).

3.2 Federal government involvement

The United States federal emergency management efforts focus on preparedness, mitigation and recovery more than response. Federal response efforts are limited to only the largest incidents, and the federal government does not get involved in response activities unless absolutely necessary. Federal response plans provide the framework for requesting, coordinating and delivering federal assistance in any federal disaster or emergency.

In the spirit of preparedness, different federal entities such as EPA (Regions 6 and 9) and the U.S. Department of Defense have participated in training exercises (table-top exercises and formal training such as Incident Command System) and information exchange activities and also have donated equipment to sister city efforts. A successful partnership between EPA and the U.S. Northern Command in the form of a Memorandum of Agreement enhanced border preparedness and readiness. The partnership resulted in a number of benefits:

- Provision of response equipment and training for 10 Mexican border sister cities during the past 4 years.
- Training of more than 650 Mexican first responders.
- Training, equipment and technical/training materials facilitated by $1,919,316 in funding.

The La Paz Agreement established the Mexico-U.S. Joint Contingency Plan to provide a binational coordination mechanism for protecting human health and the environment and responding to significant chemical and oil contingencies or emergencies that affect the inland border area between the United States and Mexico (USEPA 1999). This was finalized under Border 2012. The La Paz Agreement also established the Joint Response Team (JRT), which has coordinating authorities for both Mexico and the United States. The JRT comprises representatives from U.S. and Mexico federal, state and local agencies responsible for emergency prevention, preparedness and response in the border region. The work of the JRT is supported by a robust system for the binational notification (Figure 11) of

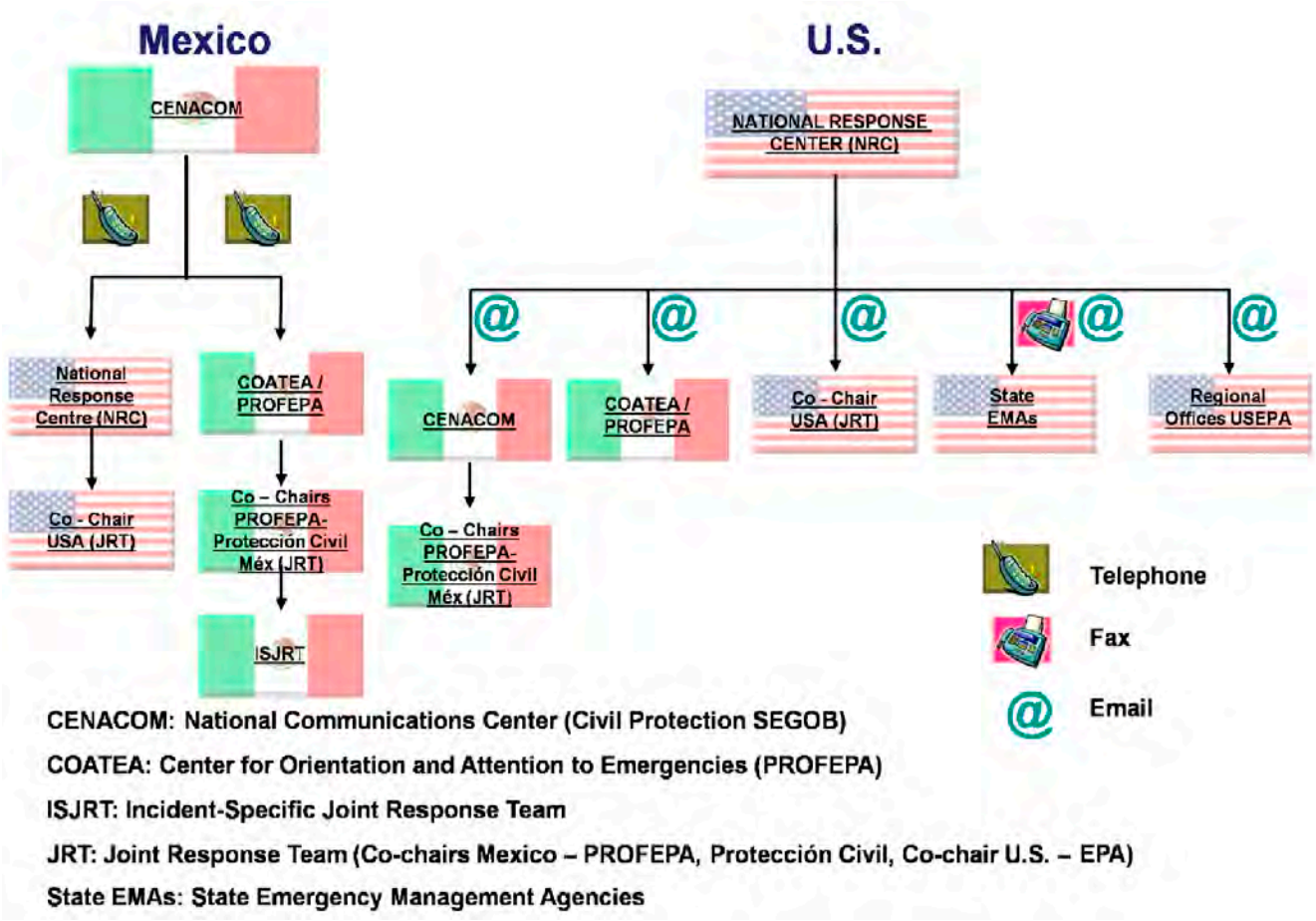
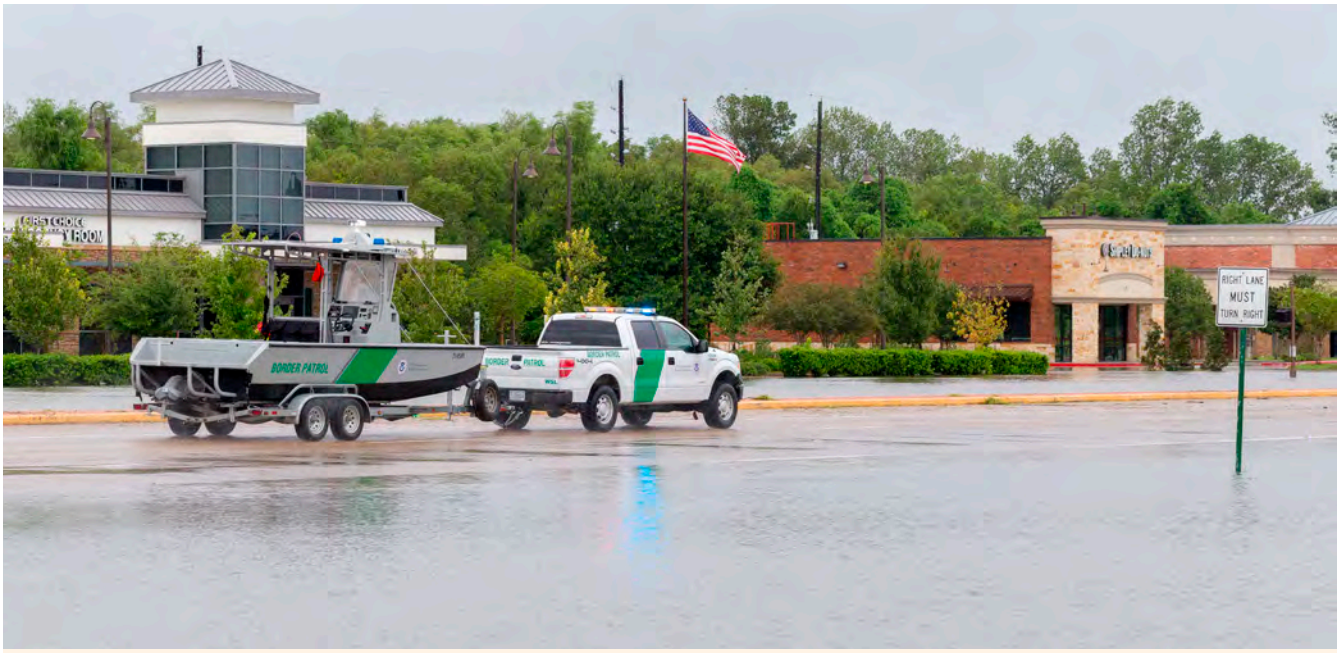


Figure 11. U.S.-Mexico binational notification system.
Source: EPA and SEMARNAT (2016).

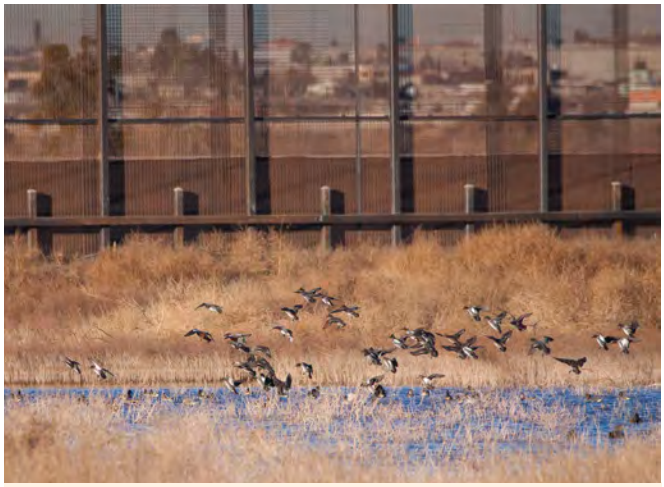


Texas Border Patrol trucks with boats being deployed for rescue missions in flooded areas.
Source: michelmond/Shutterstock.com.

emergency response incidents, drills and threats and local Emergency Response Plans developed jointly by sister cities along the border. It also is supported by extensive training to provide capacity building to enhance response readiness, cross-border coordination and training continuance for hazmat and emergency response capabilities of both countries.

3.3 Water management, flooding, and trash and sediment control

Maintaining a balance between effective measures to secure the border and minimizing the environmental effects has been challenging. Some of the effects of increased security measures, especially infrastructure installation and additional enforcement activities, include accumulation of sediment and trash, deterioration of water quality, and effects on watersheds and the environment. The case studies of this section focus on the security measures implemented, such as border fences or increased patrols, and the effects that have been experienced by communities, personnel or the environment. In some areas, enforcement was increased, but a border fence was not constructed. It is important to evaluate both areas in terms of security, social, economic, environmental and health effects to make effective decisions in future strategies for securing the border. The studies also were selected to highlight the geographic setting, successes and concerns that have been seen in the 10 years since the 10th Report; they are representative of the different landscapes found along the U.S.-Mexico border.



A reclaimed wetland in El Paso provides rare habitat to birds in the region.

Source: Krista Schlyer.

3.3.1 Case study: Tijuana River National Estuarine Research Reserve (TRNERR)

Geographic context

The Tijuana River Watershed is a large, 1,700-square-mile system straddling the international border with one-quarter located in the United States and three-quarters in Mexico (Wright and Vela 2005). The Tijuana River Watershed includes three POEs, much of urban Tijuana and dense populations in south San Diego County, topography from sea level to more than 6,000 feet, diverse microclimates and ecosystems, and numbers of threatened and endangered species. The Tijuana River crosses the international border 4 miles from the coast and drains through an 8-square-mile valley mainly in the United States and along the border. A significant portion of the river valley in the United States is designated as the TRNERR, recognizing the important ecological, historical and cultural resources of this region. The reserve is protected and managed through a federal-state cooperative effort with the National Oceanic and Atmospheric Administration and California State Parks for long-term research, education, training and interpretation. TRNERR and adjacent areas are important locations for recreation and nature tourism, especially bird watching because the estuary is at once a nesting site and stopover on migration for many avian species.

Issues

TRNERR includes beach, dune, mudflat, salt marsh, riparian, coastal sage scrub and upland habitats surrounded by the growing cities of Tijuana, Mexico, and San Diego and Imperial Beach, California. Border security and enforcement efforts have had a huge impact in the area in the past decades as security imperatives and practices have evolved. Critical issues faced by the reserve include habitat conservation and restoration, endangered species management, management of the wastewater from Mexico, sediment and solid waste management, and the integration of recreation activities.

The Tijuana-San Diego interface has been the focus of increasing installation of border security infrastructure and more intense enforcement activities since the 1990s. This activity, especially the renewed security efforts after 9/11, have had a number of environmental effects, most notably increased sedimentation from

fence and road construction and increased patrol activities in vehicles. The construction of the access roads and enhanced fence were pushed through very rapidly without accompanying stormwater infrastructure and revegetation of disturbed areas. Eventually, these mitigation steps were taken by USBP, lessening the sedimentation problem. Threatened species and important habitats also were adversely affected. These security activities compounded the effects originating in upstream urban Tijuana areas consisting of renegade sewage flows and quantities of solid waste and sediments transported across the border by intense winter storms.

Partnerships

Other agencies involved in land management in the river valley include the U.S. Navy, CBP and FWS. The USIBWC also operates the South Bay International Wastewater Treatment Plant. The USIBWC's operation and maintenance costs for 2016 were approximately $15 million, treating on average 25 million gallons of sewage per day that originates in Mexico. The USIBWC also has invested $18.5 million at the facility toward infrastructure improvements. The International Wastewater Treatment Plant, serving 800,000 people, was funded by EPA at a cost of $239.4 million (Liden 2017). Additionally, EPA has invested $1.5 million in addressing trash and sediment via the Border 2012/Border 2020 programs and related efforts such as the West Coast Estuaries Initiative, furthering the effort to reduce the strain on the Tijuana River ecosystem.

Recognizing the many pressures that a binational and highly urbanized watershed encounters, partners, including TRNERR, the State Coastal Conservancy, and the San Diego Regional Water Quality Control Board formed the Tijuana River Valley Recovery Team to develop a recovery strategy for the valley (Tijuana River Valley Recovery Team 2012). The recovery strategy and subsequent actions contributed to the development by the IBWC of Minute 320 of the 1944 Water Treaty, which is for binational coordination of the Tijuana River Watershed, and initially focused on pollution and sediment issues in the Tijuana River Valley.

Mitigating Impacts

TRNERR approaches water quality issues and trash and sediment control through a three-pronged approach: (1) address the issue at the source through cross-border partnerships, (2) stop pollutants before they enter sensitive habitat, and (3) restore healthy ecosystems that have increased capacity to process higher levels of pollution. At TRNERR, the majority of funding has been directed toward the second prong—stopping pollutants before they enter sensitive estuarine habitat. Between 2003 and 2005, two sediment basins were constructed within the upper floodplain of Goat Canyon to annually retain more than 40,000 cubic yards of sediment and trash. As a result, sedimentation and trash pollution in downstream riparian forest and marsh habitats has been reduced. Because of the location of the basins downstream from the urbanized and degraded watershed in Mexico, however, regular sediment and trash removal and maintenance is required.

Cleared and processed sediment from the basin being prepared for transport off site.

Source: Christopher M. Peregrin, TRNERR.

Since construction in 2005, the Goat Canyon Sediment Basins have captured nearly one-half million cubic yards of trash and sediment, allowing for effective cleanup, increased health of the estuary, and a safer environment for those that visit, live and work in this border region. This includes reducing the exposure of CBP agents to the polluted sediment and trash that is carried into the Tijuana River Valley. Habitat restoration efforts have been initiated downstream of the Goat Canyon Sediment Basins to begin the process of restoring the land damaged by the previous uncontrolled impacts and further improve the health and safety of this area.

The Goat Canyon Sediment Basin in the TRNERR filled with trash and sediment.

Source: Christopher M. Peregrin, TRNERR.

3.3.2 Case study: Laredo, Texas–Nuevo Laredo, Tamaulipas

Geographic setting

The City of Laredo is located in Webb County, Texas, and had a mid-2016 population of 257,156 (U.S. Census Bureau 2017b). It is expected to continue to grow to 610,669 by 2070 (Texas Water Development Board 2015). Growth along the border is attributed to cultural, social and economic relationships with Mexico (Texas Water Development Board 2015). In early 2016, the sister city of Nuevo Laredo, Tamaulipas, had a population of 399,431 (Instituto Nacional de Estadística y Geografía 2017). Both communities rely on commerce to support economic development. Equally important is that both communities rely on the Rio Grande as their primary water supply. The river also serves as the international boundary between the two countries.

Issue

Access to the Rio Grande for both communities is vital. The intakes that pump water for drinking and irrigation are within the river corridor and floodplain. There is a long history of familial, social and community interactions across the river. The Rio Grande remains a central focus for both communities and is a core part of their image. Maintaining the connectedness across the river is vital for both Laredo and Nuevo Laredo.

Water quality

The discharge from wastewater treatment plants, untreated wastewater renegade flows, and debris and trash from storms can affect water quality of the river. Laredo and Nuevo Laredo have experienced high levels of fecal indicator bacterial contamination in the Rio Grande. Since 1998, the communities have expressed concern about water contact recreation and degraded

water quality. One of the issues identified was damage to the sewage collection system in Nuevo Laredo that caused stormwater and wastewater cross connections.

Sanitation

BECC certified a rehabilitation project for the sewer collection system to prevent the flow from going to the stormwater drain system and into the Rio Grande. The project was completed in 2015, and a study is under way to evaluate its success.

A small outfall emanating from a concrete structure draining into the Rio Grande.

Source: IBWC.

Habitat

A section of land in the middle of Laredo (known as the Riverbend) has been a topic of discussion for more than a decade. It is within the Rio Grande floodplain and has been targeted for restoration by the city for a number of reasons. The area had been substantially degraded by encroachment of invasive species, unauthorized border crossings, informal sand and gravel mining, flood damage, security patrols, and other activities (U.S. Army Corps of Engineers 2013). Historically, this 77-acre parcel of riparian habitat had supported wildlife such as migratory birds, endangered species (jaguarundi [*Puma yagouaroundi*] and ocelot), and other animals. The Laredo Riverbend Restoration Project was initiated in 2015 and includes the restoration of riparian, wetland and aquatic habitat; improvement of water quality; reduction of erosion; and increase in habitat quality as part of a migration, foraging and breeding corridor for common native wildlife and federally and state listed species (U.S. Army Corps of Engineers 2013). The project also will make the area appropriate for recreation again.

Strategies

Nonstructural measures have been taken. Laredo is one of the few urban areas along the border where a border fence has not been constructed. The Rio Grande serves as the primary barrier to unauthorized border crossings. The City of Laredo and CBP work collaboratively and have developed a balance that has been fostered since 2006. This partnership serves as an example of bridging security measures with community and environmental values (Rio Grande International Study Center 2017). Part of restoration activities and invasive species control is to enhance security measures and improve habitat quality along the river corridor. CBP utilizes a border road and boats to conduct patrols. The City of Laredo and CBP understand that cooperation and dialog help resolve differences and lead to better outcomes.

Nonprofit organizations such as the Rio Grande International Study Center also help to promote activities to engage citizens from Laredo and Nuevo Laredo to foster awareness through civic duty and education. The Rio Grande International Study Center sponsors cleanups, science fairs and festivals throughout the year. In 2016, the center had a successful year of events, including Día del Rio (water quality monitoring by high school students throughout the watershed), the Laredo Birding Festival, and "Loving Laredo" hikes.

Monitoring the Rio Grande.

Source: Rio Grande International Study Center.

The Rio Grande remains a focal point for Laredo and Nuevo Laredo, and the sister cities continue to work together to address items that will improve water quality, reduce trash and create a healthier ecosystem. The communities firmly believe that a sustainable

Border Patrol Explorers volunteering at Manadas Creek in Laredo.
Source: Rio Grande International Study Center.

future is one that includes a connection to the river as a resource and forms part of the community to be enjoyed and protected.

The Laredo case indicates how effective approaches to border protection through adaptability and collaboration with communities can achieve security goals while supporting ecotourism and social values and maximizing the infrastructure budget. Riparian vegetation restoration was able to support security efforts and improve the quality of the local environment. The Laredo case suggests that effective solutions to border security and environmental protection challenges differ along the international border with Mexico.

3.3.3 Case study: Ambos Nogales

Geographic context

The sister cities of Nogales, Arizona, and Nogales, Sonora, commonly referred to as Ambos Nogales, are linked by the Nogales Wash and the Santa Cruz River. The Santa Cruz River originates in the Canelo Hills area of southeastern Arizona and flows south into Mexico prior to turning northward and re-entering the United States in Ambos Nogales. Ambos Nogales is in a narrow valley surrounded by mountain ranges. The population of Nogales, Arizona, has been stable for several years at around 20,000 inhabitants (Arizona Commerce Authority 2017). The 2015 population of Nogales, Sonora, was 233,952 (Instituto Nacional de Estadística y Geografía 2017), and new informal settlements, or *colonias populares* as they are known in Mexico, continue to appear on the urban margins as the area increases in population.

Flooding in Ambos Nogales. Left side of the fence is Nogales, Arizona; Nogales, Sonora, is on the right.
Source: City of Nogales, Arizona.

Issues

Wastewater for both communities is treated at the Nogales International Wastewater Treatment Plant (NIWTP), located approximately 9 miles north of the international boundary. Nogales, Arizona, contributes an average of 2 million gallons per day of wastewater for treatment, whereas an average of 11 million gallons per day is contributed by Nogales, Sonora. Wastewater is conveyed to the NIWTP through the International Outfall Interceptor. Some metals in wastewater discharged from Mexico have either exceeded the NIWTP's operational limits or U.S. regulatory standards. Additionally, because there are no stormwater management regulations and inadequate infrastructure in Mexico, stormwater inflow and infiltration contributes to binational sanitary sewer overflows during heavy rainfall.

North of the NIWTP, the treated effluent discharged into the Santa Cruz River maintains critical riparian habitat downstream in the United States for many miles and recharges aquifers that supply potable water to surrounding communities (GNEB 2016). The treated wastewater from the NIWTP supports a cottonwood–willow riparian environment that is designated as a critical habitat for the endangered Southwestern Willow flycatcher and also is recognized as an Important Bird Area (IBA) by the Audubon Society (GNEB 2014). In 2015, the Friends of the Santa Cruz River also detected the return of the endangered Gila topminnow downstream of the NIWTP. Its return is attributed to improved effluent water quality discharges into the river resulting from infrastructure improvements at the NIWTP in 2009. Wastewater flows from the NIWTP

also help Arizona comply with the Groundwater Management Act for safe yield by keeping the Santa Cruz River aquifer in balance. Under IBWC Minute 276, however, Mexico has no obligation to deliver wastewater to Arizona for treatment and eventual discharge into the Santa Cruz River.

Storm events often contribute to the transfer and accumulation of waste along Nogales Wash and the Santa Cruz River in addition to flooding and overflow of the binational sewage treatment system. The migration of wastes into the United States via the Nogales Wash and the Santa Cruz River represents a significant threat to human health, infrastructure and the environment. These storm-related effects also pose health and safety concerns for border security personnel in addition to the entire community.

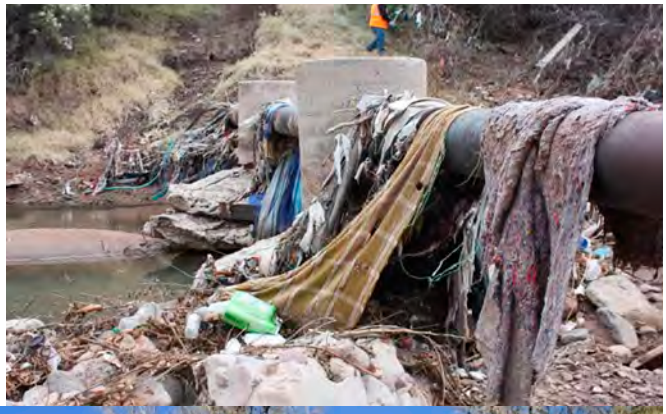
A severe storm in July of 2008 produced significant runoff, causing manholes to overflow as large amounts of trash and sediments were swept into the commercial downtown area. Runoff in this section of the city had been impeded by the design of the wall separating the cities, which trapped trash and formed a dam. The flooding damage caused the pedestrian Morley Avenue POE to be closed for 16 days as damage to businesses and streets were cleaned up. Damage to businesses and infrastructure in Nogales, Sonora, was estimated at $8 million, and Nogales, Arizona, also experienced significant economic loss. The border wall in this section had been reinforced earlier in 2008 to stem the flow of drugs and persons entering the United States illegally. Subsequently, the design of the wall was altered to reduce flood risk from this security infrastructure (Coppola 2008).

Another intense storm in July 2014 destroyed and lifted sewer mains and caused mudslides in Nogales, Sonora. The DeConcini POE was closed for approximately 10 hours that day so that port staff could clear out the one-half inch of sewage and mud in processing areas, sweep out a storm grate, pick up trash, and move sand bags (Coppola 2014).

These periodic storms and flooding produce major damage in Ambos Nogales. The torrential rains and runoff are complicated by a variety of diverse factors, such as security infrastructure, solid waste originating in Mexico, and stormwater infrastructure inadequacies. The investigation, mitigation and cleanup of the wastes originating in Mexico and being transported to the United States are complex issues requiring action on both sides of the border.

Mitigation efforts

In 2015, EPA commissioned a waste characterization study for this watershed. Trash cleanups in the binational watershed that same year removed 4 tons of trash in Nogales, Sonora, prior to the monsoon season



Before and after cleanup photos in the Santa Cruz River in Nogales, Arizona.

Source: Booz Allen Hamilton (December 2015).

in June, and 29 tons of trash in Nogales, Arizona, in December. The latter cleanup was prioritized because of the copious amounts of debris that had accumulated around a sewer pipe that connected to the International Outfall Interceptor.

Another strategy to mitigate the effects of stormwater flows in Ambos Nogales involves green infrastructure such as swales, gabions and other detention features. Some of these features have been implemented or supported through projects funded by the Border 2012 and Border 2020 programs.

Nogales, Sonora, Detention Basin La Bellota.
Source: Watershed Management Group.

The Ambos Nogales region illustrates complexities in managing security and environmental challenges in transborder metropolitan regions. Binational watersheds are complex natural systems with complicated governance issues and require collaboration among colleagues from each side of the border. Without effective communication and coordination, dire impacts are witnessed by the local communities while affecting the ability of security personnel to safely perform their jobs. Moving through tunnels and washes that have been overrun with stormwater and sanitary sewer overflows creates public health and safety risks. To mitigate such occurrences, it is imperative that collaboration with local stakeholders and security officials continue for a secure border and economic vitality in the region.

3.3.4 Case study: The New River along the U.S.-Mexico border region

Geographic context

The New River has been known as a source of environmental and health problems since the early 1940s. The New River is within the Salton Sea Transboundary Watershed and has its beginnings approximately 20 miles south of the U.S.-Mexico international boundary, near Cerro Prieto in the Mexicali Valley, Mexico. The river travels for another 60 miles in the United States through the Imperial Valley in California before it discharges its contents into the Salton Sea, California's largest inland surface water body (**Figure 12**). In Mexico, the New River collects agricultural drainage from the Mexicali Valley as well as stormwater runoff and industrial and municipal wastewater as it passes through the City of Mexicali on its way through the City of Calexico, California. In California, the river collects municipal treated wastewater, stormwater runoff and agricultural runoff from the Imperial Valley before it discharges its flow into the Salton Sea. The New River is encased in the Mexicali metropolitan area, and it crosses into Calexico near the U.S.-Calexico West POE (**Figure 13**).

New River security and environmental issues

In 2013, the IBWC estimated the average flow of the New River was between 80–100 million gallons per day (3.5–4.4 cubic meters per second) at the border. Although several actions implemented in Mexico during the last decade have significantly improved the water quality of the flows, the New River still fails to meet U.S. Clean Water Act water quality standards as it enters the United States, in particular pathogen-indicator bacteria standards established to protect public health. Sewage infrastructure problems in Mexicali produce discharges of raw municipal sewage from 0.7 to close to 15 million gallons per day into the New River. A recent estimate is that approximately $80 million would be required to correct infrastructure problems in Mexicali (California Regional Water Quality Control Board 2017). This also contributes to the New River being the most polluted river in California. The New River poses a health threat, especially for people who have contact with the river's waters. Although encased in Mexico, it still is used by migrants who attempt to cross into the United States.

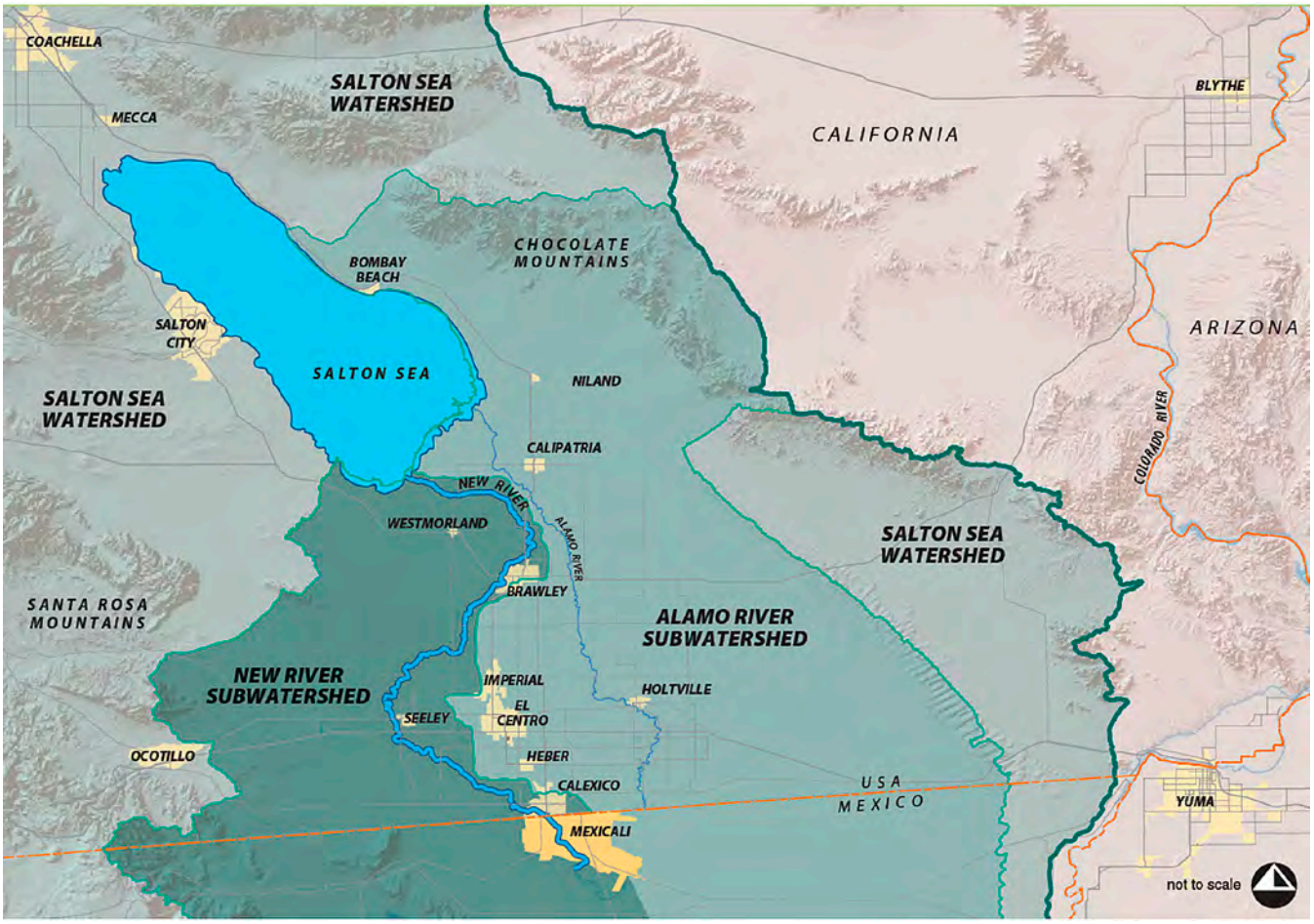


Figure 12. The New River geographical location.
Source: New River Improvement Project Technical Advisory Committee (2011).

Exposure to the river's waters has negative health implications for migrants and the U.S. security personnel who apprehend them.

The impairments of the New River include pathogens, dissolved oxygen, nutrients, pesticides, metals, trash and sediment, and others. The tributary drains to the New River in Mexicali continue to be dumping grounds for trash and are one of the main sources of trash that is brought across the border by the river flows. In the United States, the primary sources of pollution are agricultural runoff from the Imperial Valley, which carries nutrients, sediments and pesticides. Stormwater runoff also contributes to the water quality problems but to a lesser degree.

The California Regional Water Quality Control Board's Colorado River Basin Region estimates that about 120 tons of trash are dumped every year into the New River and its tributaries (New River Improvement Project Technical Advisory Committee 2011). Solid waste transported in the New River is not removed and accumulates downstream. The two screens installed by the Border Patrol are to deter illegal border crossers and not to remove trash. The California-Mexico Border Relations Council's New River strategic plan recommends that the U.S. government either (1) construct/install/operate/maintain trash screens immediately downstream from the International Boundary in the United States or (2) assist Mexico to construct/install/operate/maintain trash screens immediately upstream from the International Boundary in Mexico (Technical Advisory Committee for New River Strategic Plan 2016). The strategic plan also recommends encasing the New River from a point immediately downstream from the border to a point downstream from where the river crosses the West Branch of the All-American Canal to isolate the contaminated waters from possible human contact.

Figure 13. The New River is encased until it nears the border, but it is not encased in the United States.
Source: Jose Francisco Zamora-Arroyo, Sonoran Institute (November 2016).

Screen placed across the New River by the U.S. Border Patrol. Designed to stop people, the screen also traps solid waste.
Source: Watershed Management Group.

Chemical and biological problems and solid waste in the New River present challenges for the surrounding communities and present risk not only for migrants who attempt to use the waterway to cross into the United States but also for USBP and local emergency response personnel who have contact with the river's waters. Addressing these problems in a cost-effective way requires not only coordination across the border but also careful planning and cooperation by security agencies and other stakeholders. The screens across the New River installed by the USBP to deter migrant movement provide an example of a missed opportunity to include environmental benefits into the original border security infrastructure design. As installed, the screens are raised to let accumulated trash float down the river instead of removing this material. A better design would provide the necessary barrier to human passage, but would remove the trash from the river for proper disposal (New River Improvement Project Technical Advisory Committee 2011). With proactive involvement of local and state authorities, a solution that provides security and removes trash could have been designed and installed, with benefits to all stakeholders.

CHAPTER 4
Recommendations

This 18th Report examines the environmental implications of increased border security infrastructure within the context of GNEB's 10th Report from 2007 and its advice letter of December 2009, both of which addressed border environment and security. The earlier GNEB report provided general and specific recommendations for meeting the security and environmental needs of the border region. Appendices of this report provide detailed descriptions of the recommendations from the 2007 10th Report and December 2009 advice letter and actions taken by federal agencies to address those concerns.

The 10th Report and December 2009 advice letter also provide recommendations of a more general nature. Most important are the recommendations in two areas. First, the Board advised that federal policy makers concentrate on stronger communication and collaboration between security agencies and environmental protection and land management agencies on matters relating to border security and border security infrastructure. Second, the Board recommended strategic mixing of technology and infrastructure to reflect different security and environmental needs for the varied geography of the border (GNEB 2007, 2009).

In the 18th Report, the Board focuses on five key overlapping challenges where environmental protection intersects with border security: (1) tourism and recreation economy; (2) habitat integrity and wildlife corridors; (3) water management, flooding, and trash and sediment control; (4) hazmat and emergency response; and (5) air quality. Please see **Chapters 2** and **3** for a more in-depth discussion of each of the following recommendations, with the exception of the first recommendation below, which is discussed in **Chapter 1**.

Coordination of agency planning and implementation with local border communities

- The Board recommends continued careful planning and coordination among federal agencies to mitigate the impacts as border security infrastructure is built out and enforcement activities intensify. Advance planning, coordination and stakeholder participation will improve security infrastructure, facilitate the meeting of both security and environmental goals, and help to avoid expensive mistakes.

- The Board recognizes the improvements in coordination between DHS and land management and environmental agencies since its 10th Report and December 2009 advice letter. GNEB urges that those efforts continue and also include active participation of other stakeholders, including state, tribal and local governments as well as the private sector, academics and border communities.

- DHS, DOI and USDA are encouraged to meet annually to coordinate their activities and identify successes and challenges as well as future issues and concerns. The annual

"Border Forum" that has been focused on Arizona should be expanded to include all those involved in land management and border security in the four southwestern border states.

- The Rescue Beacon Program operated by USBP has been very helpful in reducing the number of fatalities in remote areas. Likewise, DOI agencies have much improved their permitting of this activity. The Board encourages these efforts and recommends expansion as deemed necessary by USBP and land management agencies.

- Consultation with tribes should be initiated at the earliest possible time to assure that input on impacts to tribal interests is received and incorporated into project planning. Tribes are in the best position to identify Native American grave sites, historic sites, tribal natural resources or other sites of particular spiritual value that could be affected.

- The PLLA Program established by the USBP has been extremely valuable in terms of developing relationships and enhancing coordination and communication among federal, state and local entities with responsibilities in the border region. USBP should continue to support and develop this program as a means to enhance border security while also protecting the environment. Programs to educate USBP agents on environmental issues should be continued. Efforts to educate DOI, USDA, and state and local entities on the work of USBP have been very helpful and should be expanded.

- Coordination with the IBWC is encouraged to avoid unintended effects on the flow of the Rio Grande, Colorado River and Tijuana River and ensure compliance with international treaties with Mexico. Implementation of Minute 320 of the IBWC 1944 Water Treaty to address pollution and sediment issues in the Tijuana River Valley basin also should be pursued.

- The Board recommends that access to federal lands should continue to be managed under the terms of the 2006 MOU signed by USDA, DOI and DHS. The work at Organ Pipe Cactus National Monument has proven that the overriding need for access for border security can be provided while also restoring and conserving unique and valuable habitats.

- Proactive planning and cooperation with border stakeholders can enable DHS to address security concerns and meet the environmental needs of the border region. A number of efforts initiated during the past decade should be continued.

Reduce the environmental footprint of infrastructure

- The environmental footprint of border security infrastructure remains a concern of the Board. When possible, avoidance of large infrastructure projects in riparian areas, mountainous terrain and other sensitive habitats is recommended. At the same time, GNEB urges DHS to expand the successful restoration efforts on unused access roads and informal trails and roads established by illegal activities.

- Use of surveillance technology such as integrated fixed towers, ground sensors, remote video surveillance towers, and other methods have proven to be very helpful in detecting illegal activity and directing the appropriate law enforcement response. Wherever feasible, the Board encourages the use of the appropriate technologies to enhance border security and reduce the footprint of border security measures.

- Use of green infrastructure as natural barriers to the transport of undocumented peoples or goods should be examined as an option to improve physical border security and environmental quality where viable.

Protect wildlife migration and habitat corridors

- The Board recommends that DHS engage all stakeholders to develop and design innovative approaches to ensure that sensitive species can move back and forth across the border while still meeting security needs.

- The Board recommends the monitoring of environmental impacts, including impacts on hydrology and wildlife movements, to assist in the design of future border security infrastructure and the development of possible mitigation measures for impacts that may be detected through monitoring.

- In the design of border security infrastructure, DHS should seek to minimize or avoid measures that would impede the flow of wildlife across the landscape. Recognizing that some structures by their very nature may have impacts, measures such as the ocelot openings in south Texas could be used.

- Design of vehicle barriers that preclude passage of motorized vehicles should be developed so that movement of large mammals (e.g., deer, sheep, pronghorn antelope) still would be possible.

- Joint projects with tribes and federal and state agencies to remove invasive plants from riparian areas should be expanded.

Utilize environmental reviews to mitigate unintended impacts

- If the DHS Secretary waives environmental review, several measures can be undertaken to avoid or minimize impacts on the environment, archeological and historic resources. DHS should coordinate, to the extent practicable, with DOI and USDA land management agencies, as well as appropriate state and local land managers, to avoid unintended effects of border security infrastructure.[6]

- Although traditional documents required by NEPA and the Endangered Species Act would not be required under the waiver, Environmental Stewardship Plans prepared under previous waivers are helpful in reducing negative effects through planning and in documenting work done. DHS is encouraged to prepare similar documents if a waiver is invoked for future work.

- The Board recommends that DHS use NEPA or equivalent procedures for scientific and public input as well as continued research to avoid impending disasters.

Enhance efforts to reduce flooding and trash and sedimentation flows

- The Board recommends routine coordination of all stakeholders with IBWC and other agencies to avoid flooding and excess sedimentation caused by security infrastructure. Not only will this help to reduce disastrous events, but it also can significantly help to address environmental problems. For example, screens across waterways to impede unauthorized migrants can be designed to avoid flooding during storm events. They also can be designed to facilitate removal of solid waste from rivers and storm drains.

- Although the USIBWC received millions of dollars under the American Recovery and Reinvestment Act to improve the levee system along the Rio Grande, millions more are needed to get the entire system up to FEMA standards and protect against hurricanes in the Rio Grande Valley.

- The Southern Arizona Project led by the BLM should continue. This effort has resulted in substantial reductions in trash and debris resulting from illegal immigrant traffic. BLM also has facilitated collaboration among law enforcement agencies with activities such as Operation Reclaim Our Arizona Monuments, which have helped to reduce drug and human smuggling in the Tucson area.

[6] For example, this could be achieved through coordination with land managers on affected DOI and USDA lands as early as possible. Assistance could be provided to DHS on particularly sensitive fish and wildlife habitat and archeological and historic resources as well as possible conflicts with existing public use of parks, refuges and BLM lands. Activities in proximity to Bureau of Reclamation facilities also could be coordinated to avoid impacts on water delivery.

Continue and expand cross-border fire and other emergency response systems

- Communication across the border with first responders should be enhanced. Sharing resources to assist with response to wild fires could be improved through coordination and sharing of personnel and resources.[7]

- Enhance communication efforts across the border for response on other binational situations, such as sanitary sewer overflows, to facilitate timely responses to mitigate environmental or public health emergencies.

- The ability of emergency response personnel to cross the border, along with their requisite equipment, to promptly respond to emergency situations remains a challenge in the border region. Identifying best practices, such as the Douglas, Arizona, sister city agreement, promoting those practices and enhancing them if applicable may stimulate the genesis of additional effective solutions.

- Points of contact for USDA, DOI and DHS should be identified at the headquarters level to ensure that the coordination and resolution of issues and concerns can be efficiently facilitated when needed during emergencies.

Seek further reductions in border-crossing times to improve air quality

The Board recommends that DHS continue to reduce border-crossing times at POEs for passengers, private vehicles and cargo. Faster processing of vehicles not only reduces inconvenience and costs for travelers but reduces air pollution, with health benefits to people at the POEs and surrounding communities.

Address aging infrastructure in border communities

Aging wastewater infrastructure in border communities, especially in Mexico, is resulting in failures of the collection system and causing spills that produce environmental and health concerns. The original infrastructure projects and loan programs now are limiting the cities' capacities to obtain loans to pay for the improvements. A detailed study is needed to identify the extent of the problem as well as mechanisms for paying for the infrastructure.

[7] A model could be the Mexico/United States Bilateral Response Plan (MEXUS Plan) to coordinate transboundary responses for marine waters and both Gulf and Pacific Annexes. The MEXUS Plan was updated and signed on July 11, 2017, by the U.S. Coast Guard and Secretaría de Marina (Mexican Navy).

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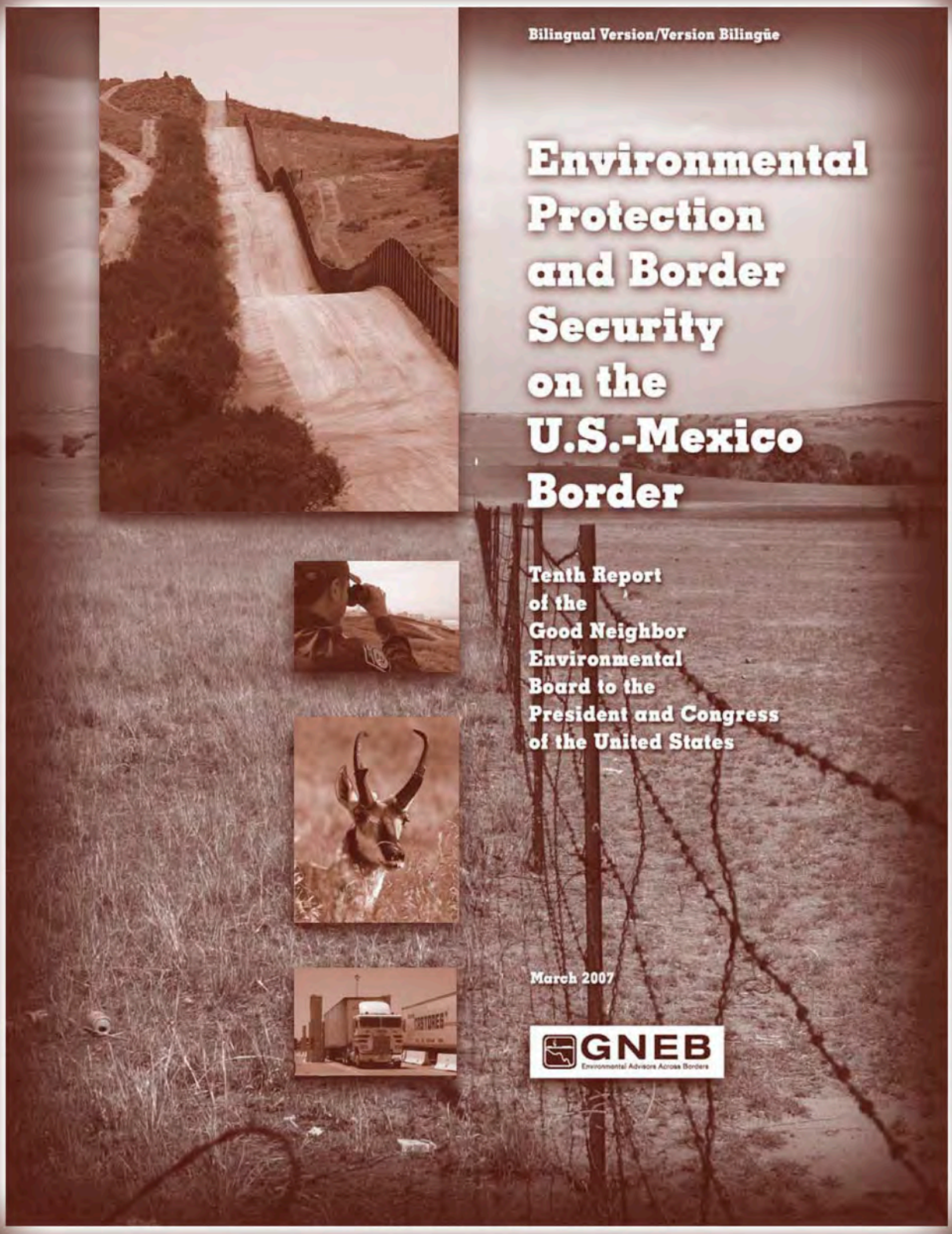
Appendix 1. *GNEB 10th Report Status Update*



The information below presents a summary of progress that federal agencies have made in advancing the recommendations of the Good Neighbor Environmental Board's (GNEB) 10th Report. The information presented is not intended to represent a complete compilation of activities; however, it is a representative sampling of notable actions that support the objectives of GNEB.

The information in this table documents considerable progress made by federal agencies in addressing recommendations and issues related to border security and environment that were raised in the GNEB 10th Report in 2010. Most apparent has been the increased cooperation among agencies concerned about border environmental issues and the agencies of the U.S Department of Homeland Security (DHS) charged with border security (e.g., U.S. Customs and Border Protection [CBP]. U.S. Border Patrol [USBP]). Progress on institutional cooperation on hazardous materials (hazmat) at the ports of entry (POEs) also is evident.

Minimal progress since 2010 also is apparent in some areas. Although the U.S. Environmental Protection Agency (EPA) and the International Boundary and Water Commission (IBWC), and to some extent the U.S. Department of the Interior (DOI), regularly engage with Mexico on matters related to environment and security, it is not clear this is true for other U.S. federal agencies. Likewise, engagement of the community in a proactive way could be improved considerably. Finally, little systematic progress has been made in developing approaches for security installations that meet the needs of environmental sustainability, particularly as related to habitat fragmentation and the need to migrate to preserve healthy populations of some threatened species.

Human Crossings

2007 GNEB Recommendation or Finding	2017 Agency Update
Recommendation 1: Strengthen communication and collaboration between security agencies and environmental protection agencies, including land management agencies, on both sides of the border. Early and ongoing cooperation and participation in the cross-agency dialogue will contribute to effective solutions that serve the core agency missions of homeland security and environmental protection while also addressing quality of life concerns of border communities.	**DHS/CBP:** Guided by the *2006 Memorandum of Understanding Among U.S. Department of Homeland Security and U.S. Department of the Interior and U. S. Department of Agriculture Regarding Cooperative National Security and Counterterrorism Efforts on Federal Lands Along the United States' Borders* (hereinafter 2006 MOU), CBP has executed a number of programs to strengthen communications with agencies on both sides of the border. These efforts are detailed in the responses below. **DOI**: Regular conference calls between U.S. Department of Interior (DOI) and CBP keep the activities of each department coordinated with ongoing activities. The Public Lands Liaison Agent (PLLA) Program established by USBP also has improved coordination greatly. At the local level, land managers with DOI are in regular contact with PLLAs and local USBP through Borderland Management Task Force (BMTF) meetings and day-to-day contact. The degree of coordination flexes with the amount of activity by USBP. **EPA:** EPA's U.S.-Mexico Border 2020 Program (Border 2020) continues to provide an ongoing venue through the task force and regional workgroup meetings to raise and coordinate with federal, state and local agencies and tribal nations on environmental issues. In the past, issues such as waste impacts on natural resources from undocumented migrant crossing and practices to mitigate these impacts on natural resources and communities were addressed. Border 2020 continues to involve CBP and other agencies in its discussions on environmental issues along the border. Additional information is provided through the EPA Border 2020 website at www.epa.gov/border2020. Further examples of EPA collaboration and communication are as follow: • EPA Region 6 Activities and Highlights: www.epa.gov/sites/production/files/2016- 10/documents/september_2016_final_1st.pdf • EPA Region 9 and CBP serve on the Tijuana River Valley Recovery Team and the Tijuana River Advisory Council. Improving water quality in the Tijuana River and New River helps the health and safety of USBP agents. These agents also report spills in Mexico to EPA and IBWC. **U.S. Section of the IBWC (USIBWC):** USIBWC communicates issues to stakeholders on a quarterly basis through its Citizens Forums. The forums are located in areas that provide coverage throughout the border. USIBWC also utilizes technical forums to address transboundary resource issues with Mexico. IBWC reviews and coordinates with the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, environmental departments, and other federal agencies to address environmental issues along the border. USIBWC is the liaison on issues between the United States and Mexico. It coordinates with Mexico on a daily basis on a variety of matters that include water accounting, flood operations, water quality, boundary, reservoir operations, permitting projects on federal lands, and sanitation issues. USIBWC works closely with DHS/CBP on a routine basis.

Human Crossings (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Recommendation 2: Strategically employ a mix of technology and personnel to meet the security and environmental needs of different sections of the border region. Vehicle barriers and sensor technology along the boundary that permit habitat connectivity and migration of important species can serve well in rural areas characterized by fragile habitats.	**DHS/CBP:** Based on systematic threat evaluation and consideration of the ecology of the area, CBP has deployed vehicle fencing, surveillance technology and communications equipment where appropriate along the southwest border. These efforts are coordinated with the appropriate resource agencies, including DOI, to minimize impacts to the human and natural environment.
Challenge 1 (p. 19): Roads and foot trails created by undocumented migrants, migrant smugglers and drug smugglers and by the interdiction agencies that pursue them cause damage to wildlife and fragile ecosystems.	**DOI:** Although no formal assessment of the effects of illegal immigrants on border ecosystems has been conducted in recent years, it is the general opinion of land managers that the negative effects of illegal immigration have been reduced significantly, and hazards to public safety also have been reduced.
Next Steps (p. 20): When possible use technology rather than new roads and barriers to achieve security goals. If additional security infrastructure is required, combine permanent vehicle barriers with ground-based radar and other technology, as well as personnel, to effectively halt undocumented crossers as close to the border as possible.	**DHS/CBP:** CBP has made extensive use of surveillance technology along the border. Based on the threat assessment and environment of a given area, different tower types and appropriate technology mixes have been installed. Integrated fixed towers are deployed in open areas using radar, visible light and infrared cameras, and other technology to detect and classify potential illegal activity. Remote Video Surveillance System towers are deployed in areas with denser groundcover along with a mix of technologies. Mobile surveillance units are deployed to preselected sites that have been screened to avoid environmental and cultural resources. The information is sent to centralized locations for analysis and used to deploy personnel to interdict illegal activity close to the border and along prescreened access routes. Vehicle barriers have been constructed to prevent access by vehicles in areas where road infrastructure on the Mexican side of the border supports vehicle access and is monitored by the surveillance systems. **DOI:** Currently, 15 integrated fixed towers are located on DOI-managed lands. The surveillance information obtained from these towers has reduced the level of vehicle surveillance required. DOI bureaus and USBP locally are continuing to work on ways to reduce the negative effects of patrol activity. An additional 15 towers have been proposed for the Tohono O'odham Nation; when installed, these should help reduce and focus vehicle patrol work.
Next Steps (p. 20): DHS should take appropriate steps to identify important or sensitive natural resources along the U.S.-Mexico border and avoid, minimize or mitigate environmental impacts on such resources wherever possible.	**DHS/CBP:** Prior to initiation of construction, CBP conducts environmental and cultural resource surveys to identify important or sensitive natural and cultural resources. CBP then adjusts locations, revises designs or alters construction methods to minimize impacts to the extent consistent with mission requirements. **DOI:** From the DOI perspective, this has improved greatly since 2007. DHS provided $17.8 million toward mitigation for waived infrastructure and has supported a variety of other project specific mitigation. Discussions with CBP during project planning also have helped to avoid unintended effects on the environment. In anticipation of additional border security infrastructure, DOI and its bureaus have been working with USBP to frame the process for coordination and communication. These efforts should help to inform USBP of sensitive sites and the measures that could be used to avoid impacts.

Human Crossings (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Next Steps (p. 20): Strengthen communication and outreach to the public to enable greater interaction with appropriate land management agencies and DHS, thus resulting in continued public input on border project development and implementation.	**DHS/CBP:** CBP uses multiple avenues to enhance communications with the public and land management agency personnel. All projects receive appropriate environmental review and the corresponding level of public input. The CBP website at www.cbp.gov includes information on environmental programs within CBP (www.cbp.gov/about/environmental-cultural-stewardship) and includes documents describing projects open for public review and projects that have completed approvals and have entered the construction phase. CBP's Office of Public Affairs facilitates public outreach and communications regarding border security activities. Additionally, the USBP PLLA and Local and Tribal Liaison programs foster coordination and support to enable greater coordination with appropriate land management agencies and the public. **DOI:** The PLLA Agent and BMTF in each sector have improved communication with DOI bureaus.
Next Steps (p. 20): Establish an office within a relevant federal agency that is dedicated to analyzing and communicating the impacts of border security on the environment.	**DHS/CBP:** As noted above, CBP analyzes and communicates the environmental impacts of construction and deployment of tactical infrastructure along the borders routinely. The Energy and Environmental Management Division in the Office of Facilities and Asset Management is tasked with overseeing the environmental programs throughout CBP to ensure that CBP is in compliance with environmental requirements and properly communicating potential project impacts to the public and management agencies. **DOI:** Within DOI no such office or function is in place now; this is handled by Public Affairs staff as needed. Public affairs communications will be a part of the planning for anticipated border security infrastructure in the next few years.
Challenge 2 (p. 21): Trash and other waste left by undocumented migrants and drug smugglers in the process of crossing despoils the landscape and puts people and wildlife at risk for disease.	**U.S. Department of Commerce (DOC)/National Oceanic and Atmospheric Administration (NOAA):** The Tijuana River National Estuarine Research Reserve has been working with U.S. and cross-border interests and communities to educate citizens about the negative effects of trash entering the ecosystem. This work is not specifically focused on the effects of undocumented migrants, rather on influencing the general behaviors of border community citizens in both countries for helping achieve environmental and human health protections. **EPA:** Border 2020 continues to provide an ongoing venue through the task forces and regional workgroup meetings to raise and coordinate with federal, state and local agencies and tribal nations on environmental issues. In the past, waste impacts on tribal lands and natural resources from undocumented migrant crossings and practices to mitigate these impacts on natural resources and communities were addressed.
Next Steps (p. 22): Provide federal government support to tribes, private landowners, rural communities, state parks and protected areas, and federal land management agencies to address sanitation and solid waste issues associated with undocumented crossings.	**DHS/CBP:** Physical barriers have, in some cases, assisted in reducing the amount of trash and other waste resulting from illegal border crossings on federal lands. **DOI:** The Bureau of Land Management (BLM) Southern Arizona Project has been funded since 2003 to remove trash and debris resulting from illegal border crossings. An annual report has been issued by BLM, the most recent in 2015. Individual land management units conduct cleanups on an as-needed basis as funds allow. The amount of trash associated with illegal crossings has decreased as illegal crossing levels have decreased. **EPA:** Border 2020 accomplishments reports can be found online: • 2011: www.epa.gov/sites/production/files/documents/b2012closeout_eng.pdf • 2011–2012: www.epa.gov/sites/production/files/documents/4-state-border-highlights-2012_0.pdf • 2014–2015: www.epa.gov/sites/production/files/2015-02/documents/highlights_report_winter_2014_2015_border2020.pdf • 2016 (Region 6 specific): www.epa.gov/sites/production/files/2016-10/documents/september_2016_final_1st.pdf

Human Crossings (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Challenge 3 (p. 22): Impenetrable fences may present significant negative consequences to wildlife and the environment.	
Next Steps (p. 22): As a best business practice, hold a national conference on fencing/barrier technology that highlights successes to date and educates the public, with participation from private sector experts and nongovernmental organizations. As an outcome, develop recommendations for prototype fences that meet security goals while minimizing environmental damage or even improving environmental conditions.	**DHS/CBP:** In March 2017, DHS/CBP issued a solicitation for design and construction of prototype fencing that meets defined security objectives. Information utilized from the prototype fencing will be utilized to inform future design standard(s), which will likely continue to evolve to meet CBP's requirements. Any and all prototypes will be designed to deter illegal entry into the United States. Through the prototyping process, CBP may identify new designs or influences for new designs that will expand the current border barrier toolkit that CBP will use to construct a border wall system based on CBP's requirements. **DOI:** DOI would support such a conference. To the department's knowledge, there has not been a conference convened that has been focused on this topic. DOI also would be willing to assist with design of future fence or wall to seek a design to minimize environmental impacts.
Next Steps (p. 23): Continue to ensure that USIBWC has the opportunity to review proposed border security infrastructure prior to construction and provide advice on ways to minimize negative transboundary impacts, such as erosion or flooding.	**DHS/CBP:** CBP has worked closely with IBWC when infrastructure projects have been executed on IBWC-managed land or have had the potential to cause transboundary effects. **USIBWC:** USIBWC has worked closely with CBP in reviewing the compatibility with U.S. treaty commitments of proposed CBP infrastructure projects, working out design modifications where necessary to ensure fulfillment of both entities' respective responsibilities and missions.

Human Crossings (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Challenge 4 (p. 23): Lack of collaboration across agencies with responsibility for border security, land management and environmental protections tends to lessen the likelihood of win-win scenarios for both security and the environment.	
Next Steps (p. 23): An interagency task force comprising DHS, DOI and the U.S. Department of Agriculture (USDA) should be established that includes their respective law enforcement components; this task force then could develop strategic plans and establish mutual goals regarding law enforcement changes that would affect federal lands, including sensitivity to environmental impacts.	**DHS/CBP:** CBP facilitates a monthly coordination meeting that includes representatives from DOI, the U.S. Forest Service and CBP. This includes representatives from both environmental and law enforcement offices, as needed, to coordinate law enforcement efforts on federal lands. At the local level, coordination among law enforcement personnel occurs regularly. **DOI:** Although not established as a task force, there is regular communication among law enforcement entities. An example is Operation Reclaim Our Arizona Monuments, an effort coordinated by BLM that focuses on fighting back against smugglers and others using public land for transporting contraband. There have been other cooperative efforts (e.g., Operation Trident Surge in Arizona, Operation Take it Outside in California) that have involved law enforcement personnel in each of the departments. Tactical efforts occur on an as-needed basis. Interoperability of land mobile radio communications also has improved and is managed through a Memorandum of Understanding (MOU) that expires in 2017.
Next Steps (p. 24): The federal government should identify communications gaps and place liaison personnel in the border states who facilitate communication among security, environmental and border land management agencies.	**DHS/CBP:** In 2005, CBP initiated the PLLA Program, which was formalized as a national program in May 2009. Each USBP sector along the southwest border has a PLLA. PLLAs support active engagement with personnel from DOI, USDA and other federal, state, local, tribal and nongovernmental organizations involved in land management, resource protection and access issues. They also promote a dialogue that includes collaboration to identify mutually beneficial activities and outcomes, joint environmental education, and border security and border safety training. PLLAs communicate up and down the chain of command to accomplish goals and objectives, serving a vital role in the facilitation of BMTFs, which are designed to facilitate an intergovernmental forum for cooperative problem-solving on common issues related to the international border. The primary mission is to address border security, human safety, and natural and cultural resource protection through shared resources, information, communication, problem-solving, standardization and training. In keeping with the 2006 MOU, issues are discussed and resolved at the local level to the maximum extent possible. Operational personnel from CBP law enforcement offices routinely interact with local, state and federal officials. CBP has participated in joint projects to support and strengthen interagency relationships, including the Operation Stone Garden grants and operations program to provide resources for state, local and tribal partners to enhance integration efforts for border security. **DOI:** The USBP PLLA Program is the best example of this, with agents identified in each sector who coordinate with DOI and USDA. DOI staffing levels have not allowed for this beyond the DOI Interagency Borderlands Coordinator position in Washington, D.C. DOI also supports a Senior Special Agent located at the USBP Tucson Sector Headquarters who coordinates with USBP on the entire southwest border. DOI plans to maintain these positions indefinitely. **EPA:** Border 2020 has collaborative efforts and liaisons to assist and facilitate communication with different partners. A consistent framework beyond the program, especially among federal agencies, remains a challenge. EPA continues to work on a more consistent framework with other agencies through local and regional outlets. The following website summarizes Border 2020, including background goals and program structure: www.epa.gov/sites/production/files/documents/border-2020summary.pdf.

Human Crossings (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Projects and Partnerships (p. 24): U.S.-Mexico critical infrastructure protection frameworks.	**EPA:** EPA is an active member of the joint board of the Border Environment Cooperation Commission and North American Development Bank, binational institutions created to develop environmental infrastructure of the U.S.-Mexico border region and enhance the well-being of residents in both nations. Information related to infrastructure and collaboration involving these entities can be found at www.epa.gov/international-cooperation/epas-role-border-environment-cooperation-commission-becc-and-north. **IBWC:** IBWC signed Minute 320 on October 5, 2015, to address sanitation and water quality issues in the Tijuana River Watershed. Binational technical workgroups for the New River and Nogales areas discuss sanitation (pretreatment issues, water quality, and collaboration and coordination between the United States and Mexico). IBWC continues to address security and safety measures at Amistad and Falcon dams, working closely with CBP and federal agencies and binationally with Mexico.
Projects and Partnerships (p. 24): Douglas-Agua Prieta stormwater partnership.	**EPA:** Border 2020 information as related to the Douglas, Arizona, wastewater treatment: • Border 2020 Action Plan (2016): www.epa.gov/sites/production/files/2015-07/documents/final_arizona_sonora_2015_2016_action_plan.pdf • Environmental assessment for Douglas, Arizona, Wastewater Collection and Potable Water Distribution Improvement Project (2001): nepis.epa.gov/Exe/ZyPDF.cgi/P1008NUV.PDF?Dockey=P1008NUV.PDF
Projects and Partnerships (p. 24): MOU to facilitate security and minimize environmental damage on federal borderlands.	**DHS/CBP:** Guided by the 2006 MOU, CBP, DOI and USDA have executed a number of programs that strengthen border security while minimizing negative effects to the environment on federal borderlands. **DOI:** The 2006 MOU signed by DHS, USDA and DOI has continued to provide a framework for cooperation and coordination. The MOU has been reviewed annually by the signatories, and no changes have been proposed. DOI and DHS are in the process of updating current MOUs and preparing new agreements relating to environmental reviews in anticipation of additional border security work. These are expected to be updated or renewed this calendar year. Individual land management units also have negotiated agreements for road maintenance and other activities.

Hazardous Materials

2007 GNEB Recommendation or Finding	2017 Agency Update
Recommendation 1: At POEs, increase the number of hazmat inspectors and establish specific sites and hours for hazmat vehicles. Duplicate successful approaches, including use of appropriate technology. Increase cooperation between environmental agencies and security agencies through approaches that reflect site-specific language and staffing requirements.	**DHS/CBP:** Within budget constraints, CBP has increased staffing at POEs and has expanded the capacity at several land POEs on the southwest border. Joint inspection programs, such as the joint inspection facilities at the Otay Mesa commercial port, are being implemented and considered for expansion as budgets allow. **DOC/NOAA:** For both recommendations and the subordinate challenges, the following information is provided to raise awareness of the specialized response capability of NOAA. NOAA's Office of Response and Restoration (OR&R) is a center of expertise in preparing for, evaluating and responding to threats to coastal environments, including oil and chemical spills, releases from hazardous waste sites, and marine debris. OR&R provides scientific and technical support to prepare for and respond to oil and chemical releases; determines damage to natural resources from these releases; protects and restores marine and coastal ecosystems, including coral reefs; and works with communities to address critical local and regional coastal challenges. OR&R comprises three divisions—Emergency Response, Assessment and Restoration, and Marine Debris—and collectively provides comprehensive solutions to environmental hazards caused by oil, chemicals and marine debris. OR&R works closely with the U.S. Coast Guard in responding to incidents. **EPA:** EPA continues to work with federal, state, regional, tribal and local entities to ensure that hazmat is handled in accordance with applicable environmental regulations. Border 2020 continues to convene binational waste and enforcement task forces that provide venues to facilitate information exchange and cooperation on environmental issues, including issues at POEs. Additional information related to hazmat management along the border can be found at www.epa.gov/border2020/border-2020-enforcement-webinar.
Recommendation 2: Beyond POEs, resolve liability issues for cross-border emergency responders and provide targeted support that reflects the needs of border communities within the larger national strategic plan. Document and share best emergency response practices. In addition, increase dialogue with tribal entities about hazmat transported near and through tribal lands and increase tribal participation in training exercises.	**DHS/CBP:** USBP agents have participated in several local emergency response actions and coordinate with local and state emergency responders. Improved mobile communications connections have facilitated both improved cooperation and response. **EPA:** Border 2020 continues to have a main goal to address emergency response needs along the U.S.-Mexico border. Discussions to resolve liability issues in which EPA is involved are ongoing. The best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plans. EPA's Office of Land and Emergency Management (OLEM)/Office of Emergency Management (OEM) has been coordinating with Regions 6 and 9 to incorporate tribal governments in emergency response planning and preparedness efforts along the U.S.-Mexico border with respect to the sister city contingency plans. Additional information can be found on the Border 2020 website at www.epa.gov/border2020/emergency-response-policy-forum.

Hazardous Materials (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Challenge 1 (p. 34): POEs lack staff to inspect all shipments of hazmat, including hazardous waste, and some local emergency responders have inadequate training. Environmental agencies also lack hazmat tracking data as well as more general chemical storage data. Although CBP prescreens shipments before leaving 32 foreign ports, it does not do so at land ports in Mexico.	**DHS/CBP:** Key ports have crossing sites designated for hazmat with some trained officers. CBP's primary interest is to protect the border from inadvertent spills and conduct inspections of shipments to prevent illegal crossings. Additionally, CBP has worked with EPA to improve information flow via the International Trade Data System (ITDS). Regulations and procedures currently are in process to facilitate these improvements.
Next Steps (p. 34): Increase the number of hazmat inspectors at POEs.	
Next Steps (p. 34): DHS should provide additional support for Mexican counterparts, especially Protección Civil and local Mexican fire departments.	**EPA:** Through Border 2020 Goal 4 (Emergency Response), Objective 3, training has been provided to entities on both sides of the border: www.epa.gov/border2020/emergency-response-policy-forum.
Next Steps (p. 34): Establish specific POE sites/hours for hazmat vehicle use.	**EPA:** EPA continues to work with federal, state, regional and local entities to ensure that hazmat is handled in accordance with applicable environmental regulations. An example of inspection collaboration between agencies, including federal and local, can be seen at California POEs, where hazmat is authorized to come through only during specific times on designated days when federal and local environmental inspectors are present: www.epa.gov/sites/production/files/documents/b2020-enf2013-workshop-border-inspections-en.pdf.
Next Steps (p. 34): Best practices, such as San Diego County's hazmat inspection program or the City of Laredo's warehouse ordinance, need to be shared with other communities.	**EPA:** The best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plan updates.
Next Steps (p. 35): New electronic manifest.	**EPA:** EPA OLEM/Office of Resource Conservation and Recovery currently is developing an electronic hazardous waste manifest system (www.epa.gov/hwgenerators/hazardous-waste-electronic-manifest-system-e-manifest) in response to a statutory mandate under the 2012 Electronic Hazardous Waste Manifest Establishment Act. The system is scheduled to begin operations in the spring of 2018. The first phase of implementation will include the domestic manifest process, and a second phase of system development and rulemaking likely will expand the system to include the tracking of export manifests.

Hazardous Materials (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Next Steps (p. 35): Radio frequency identification (RFID).	**EPA:** RFID is a method of marking and tracking drums of waste to ensure that shipments reached their destination that was tested under EPA's former Environmental Technology Verification Program. Although the technology worked, it had some issues and implementing it would have required a regulatory change, unless its use was voluntary. The Waste Import Export Tracking System (WIETS) is the tracking system currently used in the United States. • RFID Project Results: nepis.epa.gov/Exe/ZyPDF.cgi/P100FZQS.PDF?Dockey=P100FZQS.PDF • RFID Stakeholder Meeting: nepis.epa.gov/Exe/ZyPDF.cgi/P100K341.PDF?Dockey=P100K341.PDF • RFID Project Plan: nepis.epa.gov/Exe/ZyPDF.cgi/P10049JN.PDF?Dockey=P10049JN.PDF • WIETS: www.epa.gov/hwgenerators/information-exporters-resource-conservation-and-recovery-act-rcra-hazardous-waste
Next Steps (p. 35): Automated Commercial Environment (ACE) System and ITDS.	**EPA:** EPA made regulatory and information technology system changes to meet Executive Order 13659. This provided the capability to convert border processes necessary to clear the following cargo from paper to electronic under the ITDS and its supporting ACE system: (1) chemicals and waste chemicals for import subject to regulations implementing the Toxic Substances Control Act (TSCA); (2) pesticides for import subject to regulations implementing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); and (3) hazardous waste for export subject to regulations implementing the Resource Conservation and Recovery Act (RCRA). With respect to hazardous waste export shipments, paper consent checks and submittal of paper manifest to CBP at the border were converted to electronic validation of consent and entry of manifest tracking number in the Automated Export System in CBP's ACE System. Basic information on RCRA export and import requirements can be found at www.epa.gov/hwgenerators/basic-information-resource-conservation-and-recovery-act-rcra-export-and-import.
Challenge 2 (p. 35): Emergency responders are not able to easily cross the border to respond to incidents because of insurance, liability, national sovereignty and command issues, and customs and border procedures may delay response.	**DOI:** DOI reached an agreement with Mexico to allow for cross-border support for wildfire suppression. The agreement allows for response in proximity to the border (within 10 miles). DOI personnel conduct these activities consistent with an operating plan that has been provided to Mexico. Mexico has not provided a similar plan to the United States. The plan is in preparation, but it is not known when the plan will be finalized. **EPA:** An example of local liability resolution is seen in Douglas, Arizona, which has created agreements allowing its first responders to cross the border. EPA OLEM/OEM has been coordinating liability and crossing issues, where possible, with the sister city plans. More information on sister city plans can be found at www.epa.gov/border2020/cross-border-contingency-plans-us-mexico-sister-cities.
Next Steps (p. 35): Resolve liability issues for cross-border emergency responders. Next Steps (p. 35): Coordinate binational federal customs.	**EPA:** An example of local liability resolution is seen in Douglas, Arizona, which has created agreements allowing its first responders to cross the border. EPA OLEM/OEM has been coordinating liability and crossing issues, where possible, with the sister city plans. More information on sister city plans can be found at www.epa.gov/border2020/cross-border-contingency-plans-us-mexico-sister-cities.
Challenge 3 (p. 36): Technology equipment and personnel issues: environmental protection needs of small U.S. communities, Mexican communities and U.S. tribes are overlooked in the "big picture".	**EPA:** EPA OLEM/OEM has been coordinating with Regions 6 and 9 to incorporate tribal governments in emergency response planning and preparedness efforts along the U.S.-Mexico border with respect to the sister city contingency plans, which can be found at www.epa.gov/border2020/cross-border-contingency-plans-us-mexico-sister-cities. The El Paso, Texas–Ciudad Juárez, Chihuahua–Sunland Park, New Mexico–Ysleta del Sur Pueblo sister city plan was updated in 2009 and now includes the Ysleta del Sur Pueblo tribe. Approval is pending for the Tohono O'Odham Nation–State of Arizona–Sonoyta, Sonora plan.

Hazardous Materials (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Next Steps (p. 36): Provide additional support for low-tech, small-scale, local environmental protection efforts, Mexican communities, and tribes as part of overall strategic planning for national security.	**EPA:** Best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plan updates; please see responses provided above for further information. For example, a trinational emergency response plan between the Tohono O'odham Nation, United States and Mexico currently is being finalized to address the needs of the region: www.epa.gov/border2020/cross-border-contingency-plans-us-mexico-sister-cities.
Next Steps (p. 36): Where U.S. local emergency responders provide assistance, their experiences need to be documented and shared for the benefit of other U.S. and Mexico responders.	**EPA:** Best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plan updates; please see responses provided above for further information. For more information on emergency response, see the Border 2020 website at www.epa.gov/border2020/emergency-response-policy-forum.
Challenge 4 (p. 36): An overarching strategic plan for border region POEs is needed that reflects development, population, language, and staffing requirements, which also would lessen tensions that exist between security and environmental protection personnel at some ports of entry. Other border concerns include industrial development on the border, the large population on the border, the lack of protective equipment for Mexican emergency responders, the language, and tourists and migrant workers in the area.	
Next Steps (p. 37): Strengthen communication and collaboration.	**EPA:** Best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plan updates. For more information on emergency response, please see the Border 2020 website at www.epa.gov/border2020/emergency-response-policy-forum.
Next Steps (p. 37): When planning for border emergencies, consider actual settings of the border.	**EPA:** Best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plan updates. For more information on emergency response, please see the Border 2020 website at www.epa.gov/border2020/emergency-response-policy-forum.

Hazardous Materials (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Challenge 5 (p. 37): Tribal funding and communication pose a challenge, specifically the inability of border tribes to receive funding for emergency response and less than desirable communication on hazmat transported through and adjacent to tribal lands.	**EPA:** EPA OLEM/OEM has been coordinating with Regions 6 and 9 to incorporate tribal governments in emergency response planning and preparedness efforts along the U.S.-Mexico border with respect to the sister city contingency plans. Best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plan updates. For additional information see the sister city plans at www.epa.gov/border2020/cross-border-contingency-plans-us-mexico-sister-cities.
Next Steps (p. 37): DHS should earmark funding specifically for border tribes.	
Next Steps (p. 37): Increase tribal participation in training exercises that involve federal, state and local entities.	**EPA:** Best emergency response practices are being shared at quarterly trainings and task force meetings and through sister city plan updates; please see responses provided above for further information. **Additional example:** Tribes were involved in the Lower Colorado River Pipeline Functional Exercise: https://www.kindermorgan.com/content/docs/the_responder_2017_02.pdf.
Projects and Partnerships (p. 38): RFID pilot to track hazardous waste shipments.	**EPA:** RFID is a method of marking and tracking drums of waste to ensure that shipments reached their destination that was tested under EPA's former Environmental Technology Verification Program. Although the technology worked, it had some issues and implementing it would have required a regulatory change, unless its use was voluntary. WIETS is the tracking system currently used in the United States. • RFID Project Results: nepis.epa.gov/Exe/ZyPDF.cgi/P100FZQS.PDF?Dockey=P100FZQS.PDF • RFID Stakeholder Meeting: nepis.epa.gov/Exe/ZyPDF.cgi/P100K341.PDF?Dockey=P100K341.PDF • RFID Project Plan: nepis.epa.gov/Exe/ZyPDF.cgi/P10049JN.PDF?Dockey=P10049JN.PDF • WIETS: www.epa.gov/hwgenerators/information-exporters-resource-conservation-and-recovery-act-rcra-hazardous-waste
Projects and Partnerships (p. 38): Baja California Emergency Management Institute.	**EPA:** Border 2020 continues to play a role in Baja California area emergency management, as described at www.epa.gov/sites/production/files/2016-01/documents/san_diego_ca_-_tijuana_baja_ca_jan_14_2013.pdf.
Projects and Partnerships (p. 38): The Border Agency Fire Council.	
Projects and Partnerships (p. 38): Four Sister-City Collaboration.	**EPA:** Collaborations continue through the Border 2020 sister city effort: www.epa.gov/border2020/cross-border-contingency-plans-us-mexico-sister-cities.

Hazardous Materials (continued)

2007 GNEB Recommendation or Finding	2017 Agency Update
Projects and Partnerships (p. 38): Collaboration between the Arizona/Sonora Emergency Preparedness and Response Task Force and the Arizona/Mexico Commission Emergency Management Committee.	**EPA:** Task force members participate, present and provide routine updates to the Arizona/Mexico Commission Emergency Management Committee. Some additional information regarding the Arizona-Sonora Border 2020 Action Plan can be found at www.epa.gov/sites/production/files/2016-04/documents/az-sonora_action_plan_english_3_10_16_final.pdf.
Projects and Partnerships (p. 38): Interagency Arizona Port Inspection Exercise.	
Projects and Partnerships (p. 39): North American Commission on Environmental Cooperation (CEC) Waste Tracking Projects	**EPA:** The CEC's Hazardous Waste Task Force completed its report on hazardous waste tracking in August 2011. The report can be found at www3.cec.org/islandora/en/item/10158-crossing-border-opportunities-improve-sound-management-transboundary-hazardous-en.pdf.
Projects and Partnerships (p. 39): ACE System and ITDS.	**EPA:** EPA made regulatory and information technology system changes to meet Executive Order 13659. This provided the capability to convert border processes necessary to clear the following cargo from paper to electronic under the ITDS and its supporting ACE System: (1) chemicals and waste chemicals for import subject to regulations implementing TSCA; (2) pesticides for import subject to regulations implementing FIFRA; and (3) hazardous waste for export subject to regulations implementing RCRA. With respect to hazardous waste export shipments, paper consent checks and submittal of paper manifest to CBP at the border were converted to electronic validation of consent and entry of manifest tracking number in the Automated Export System in CBP's ACE System. Basic information on RCRA export and import requirements can be found at www.epa.gov/hwgenerators/basic-information-resource-conservation-and-recovery-act-rcra-export-and-import. The U.S. Food and Drug Administration provides more information about ACE/ITDS at www.fda.gov/ForIndustry/ImportProgram/ucm456276.htm, including links to user guides.
Projects and Partnerships (p. 39): EPA Enforcement and Compliance Assistance Training Programs.	**EPA:** EPA co-hosted multimedia binational enforcement workshops with the CEC, the trilateral body formed under the North American Free Trade Agreement, in Hermosillo, Sonora, Mexico, in 2007 and in San Diego, California, in 2013. State partners in California routinely provide training through EPA State Technical Assistance Grants, which includes topics such as "developing and sharing protocols for detecting noncompliant transboundary shipments of hazardous waste," as described in the 10th Report. Border 2020 continues to collaborate with states to offer recurrent training on hazmat import/export requirements. Through the task forces, Border 2020 identifies opportunities for information exchange that builds knowledge on respective regulatory programs, such as import/export requirements, and facilitates public access of compliance data for border industrial facilities. EPA Border 2020, Compliance Assistance (Goal 5): www.epa.gov/border2020/compliance-assistance-policy-forum.
Projects and Partnerships (p. 39): Joint Contingency Plan.	**EPA:** EPA OLEM/OEM is coordinating the update of the 2009 Mexico-U.S. Joint Contingency Plan with its Mexican counterparts, SEMARNAT and Civil Protection. The Joint Contingency Plan is updated, exercised and tested regularly: www.epa.gov/sites/production/files/2016-01/documents/us_mexico_joint_contingency_plan.pdf.

Appendix 2. December 2009 GNEB Border Fence Advice Letter Recommendations and Status Update

On December 2, 2009, the Good Neighbor Environmental Board (GNEB) issued an advice letter to the U.S. President and Congress regarding the U.S.-Mexico border fence. The letter was sent after Congress authorized the construction of 700 miles of border fence under the Secure Fence Act of 2006, charging the U.S. Department of Homeland Security with the responsibility for building the border fence. By the time the Board wrote the letter, most of the 654 miles of border fence had been constructed.

Prior to the Board's letter, Congress also had enacted into law the REAL ID Act of 2005, which grants the Secretary of Homeland Security "...the authority to waive all legal requirements...necessary to ensure expeditious construction of barriers and roads under this section." These legal requirements included the National Environmental Policy Act (NEPA), Clean Water Act and Clean Air Act.

The December 2009 letter from GNEB on the border fence was incorporated into *A Blueprint for Action on the U.S.-Mexico Border: Thirteenth Report of the Good Neighbor Environmental Board to the President and Congress of the United States* (13th Report), issued in June 2010. The advice letter is the longest that GNEB has issued and contains several supporting images. Although most GNEB advice letters do not receive a formal response, in 2010, Nancy Sutley, Chair of the White House's Council on Environmental Quality (CEQ), responded specifically about the border fence letter. Her response also is included in the 13th Report.

The key portion of the advice letter was a list of recommendations about the border fence. The following table contains the list of recommendations from the December 2009 advice letter, along with an update on the status of implementation actions taken (or not taken).

2009 GNEB Recommendation	2017 Update
1. Require that all border security infrastructure projects fully comply with the National Environmental Policy Act (NEPA) as well as all other laws, including environmental, historic and archeological preservation laws.	Responding for President Barack Obama in April 2010, CEQ Chair Nancy Sutley wrote, "CEQ and appropriate federal departments and agencies appreciate your recommendations of bringing border security infrastructure activities in full compliance with NEPA and our nation's environmental laws. As you know, we are reviewing the current environmental impacts of border security infrastructure and looking for opportunities for minimizing these impacts. As part of this process, we look forward to identifying opportunities for ensuring that border security infrastructure and associated maintenance and repair meet national environmental goals." The U.S. Congress has not amended the REAL ID Act of 2005, which would be required.
2. Work with Congress to amend the REAL ID Act of 2005 to remove the provisions allowing the Secretary of Homeland Security to waive legal requirements.	See update to Recommendation 1. No actions were taken to amend the REAL ID Act of 2005.
3. Fully incorporate adequate environmental review, public participation and scientific analysis into the design and implementation of all border security infrastructure projects.	CEQ Chair Sutley responded in April 2010, "CEQ and appropriate federal departments and agencies agree with the Board that public participation is important in border security infrastructure projects. CEQ, with the U.S. Department of the Interior (DOI), U.S. Forest Service, U.S. Environmental Protection Agency, U.S. Department of State, and National Oceanic and Atmospheric Administration, will continue to work with the U.S. Department of Homeland Security (DHS) to improve public review, analysis and participation in the design and implementation of select border security infrastructure projects. DHS has agreed to provide CEQ and these departments and agencies with a description of its stakeholder engagement process to foster ongoing coordination. DHS plans to obtain input from non-Federal stakeholders, including State, local and Tribal authorities and the interested public. DHS will share this information with the Board and will post it on the U.S. Customs and Border Protection (CBP) website and disseminate it through other appropriate mechanisms. In January of this year [2010], DHS officials toured the westernmost portion of the fence with the California Coastal Conservancy and provided updates on their work to the Tijuana River Valley Recovery team in December 2009 and January 2010. This exchange of information was very well received by the stakeholders."

2009 GNEB Recommendation	2017 Update
4. Facilitate review by the International Boundary and Water Commission of projects that may cause deflection or obstruction of the normal flow of rivers or their flood flows, ensuring continued compliance with the 1970 Boundary Treaty between the United States and Mexico and other international agreements.	In the April 2010 CEQ response, Chair Sutley wrote, "...the State Department encourages and welcomes recent steps by DHS to coordinate with the Commission on border fence construction, particularly in flood-prone areas."
5. Systematically monitor the entire fence and supporting infrastructure for effects resulting from its construction and develop actions to modify, redesign or mitigate the negative outcomes realized or anticipated by the existing construction.	No actions taken.
6. Provide sufficient annual funding via the DHS budget for monitoring, research and mitigation of the environmental impacts of the border fence.	From the April 2010 CEQ Chair Sutley letter, "DHS has executed an Interagency Agreement with U.S. Geological Survey to develop a monitoring protocol to determine the environmental effects of border security activities. This agreement is an important step in monitoring the impacts of the fence and its supporting infrastructure. DHS will continue to work with affected federal land resource agencies to address possible negative consequences as they are identified."
7. Obtain adequate local stakeholder input for all fence construction, mitigation and maintenance as well as for associated infrastructure projects, including access roads.	See update to Recommendation 3.
8. In sensitive rural areas that are important wildlife corridors, use barriers and technology that prevent vehicular traffic, control pedestrian incursion and allow wildlife movement.	Approximately 300 miles of the current fence consists of vehicular fence, much of it designed to allow wildlife movement.
9. Aggressively explore the use of information and remote sensing technologies that will enhance border security while reducing the physical footprint of interdiction activities along the border.	No update.

2009 GNEB Recommendation	2017 Update
10. Ensure adequate funding to DHS/CBP for ongoing training for border security personnel about the local natural environment and significant natural and cultural resources.	In the April 2010 CEQ response, Chair Sutley wrote, "The Board urged adequate funding to DHS/CBP for training border security personnel about environmental, natural and cultural resource issues. DHS already has infrastructure in place to provide some of this training. The Environmental and Cultural Stewardship Training Task Force, operated under the Director of the Border Patrol Planning Branch, is one example. It delivers environmental and cultural awareness training to Border Patrol agents whose patrol activities include Federal lands. The Environmental and Cultural Stewardship Training Task Force's mission was established within a Memorandum of Understanding entitled, *Cooperative National Security and Counterterrorism Efforts on Federal Lands Along the United States' Borders*, signed in March 2006 by the Secretaries of Homeland Security, the Interior and Agriculture." CBP also has incorporated environmental awareness and sensitivity training into the basic curriculum for all new U.S. Border Patrol agents during their initial basic training.
11. Identify and implement best management practices to prevent and mitigate the erosion resulting from fence construction and associated infrastructure.	CEQ Chair Sutley responded in April 2010, "As you know, DHS/CBP and DOI signed a Memorandum of Agreement in January 2009 regarding environmental stewardship measures related to the construction of border security infrastructure. To implement the Memorandum of Agreement, CBP agreed to fund up to $50 million to address the adverse effects of infrastructure construction and maintenance on DOI-managed natural and cultural resources. DHS and DOI are working together to release the funds so mitigation measures can occur."
12. Charge the National Academy of Sciences to conduct a study on the binational environmental effects of the border fence and associated infrastructure.	CEQ recommended that the Board discuss this with the National Academy of Sciences. GNEB did not act on this recommendation.

Glossary of Acronyms and Abbreviations

10th Report	*Environmental Protection and Border Security on the U.S.-Mexico Border: Tenth Report of the Good Neighbor Environmental Board to the President and Congress of the United States*
13th Report	*A Blueprint for Action on the U.S. Mexico Border: Thirteenth Report of the Good Neighbor Environmental Board to the President and Congress of the United States*
18th Report	*Environmental Quality and Border Security: A 10-Year Retrospective: Eighteenth Report of the Good Neighbor Environmental Board to the President and Congress of the United States*
1944 Water Treaty	1944 Water Treaty for the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande
2006 MOU	*Memorandum of Understanding Among U.S. Department of Homeland Security and U.S. Department of the Interior and U. S. Department of Agriculture Regarding Cooperative National Security and Counterterrorism Efforts on Federal Lands Along the United States' Borders*
9/11	September 11, 2001, terrorist attacks
ACE	Automated Commercial Environment (System)
BECC	Border Environment Cooperation Commission
BLM	Bureau of Land Management
BMTF	Borderlands Management Task Force
Border 2020	U.S.-Mexico Border 2020 Program (EPA)
CBP	U.S. Customs and Border Protection
CEC	(North American) Commission for Environmental Cooperation
CEQ	Council on Environmental Quality (Executive Office of the President)
DHS	U.S. Department of Homeland Security
DOC	U.S. Department of Commerce
DOI	U.S. Department of the Interior
EMS	emergency medical services
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
GNEB	Good Neighbor Environmental Board
hazmat	hazardous materials
IBWC	International Boundary and Water Commission
ITDS	International Trade Data System
JRT	Joint Response Team
MEXUS Plan	Mexico/United States Bilateral Response Plan
MOU	Memorandum of Understanding
NADB	North American Development Bank
NAFTA	North American Free Trade Agreement
NBC	National Butterfly Center
NEPA	National Environmental Policy Act
NIWTP	Nogales International Wastewater Treatment Plant
NPS	National Park Service
NOAA	National Oceanic and Atmospheric Administration
OEM	Office of Emergency Management (EPA)
OLEM	Office of Land and Emergency Management (EPA)
OR&R	Office of Response and Restoration (NOAA)
PLLA	Public Lands Liaison Agent
POE	port of entry
RCRA	Resource Conservation and Recovery Act
RFID	radio frequency identification
RFP	request for proposals
SENTRI	Secure Electronic Network for Travelers Rapid Inspection
TRNERR	Tijuana River National Estuarine Research Reserve
TSCA	Toxic Substances Control Act
USBP	U.S. Border Patrol
USDA	U.S. Department of Agriculture
USIBWC	U.S. Section of the International Boundary and Water Commission
WIETS	Waste Import Export Tracking System

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