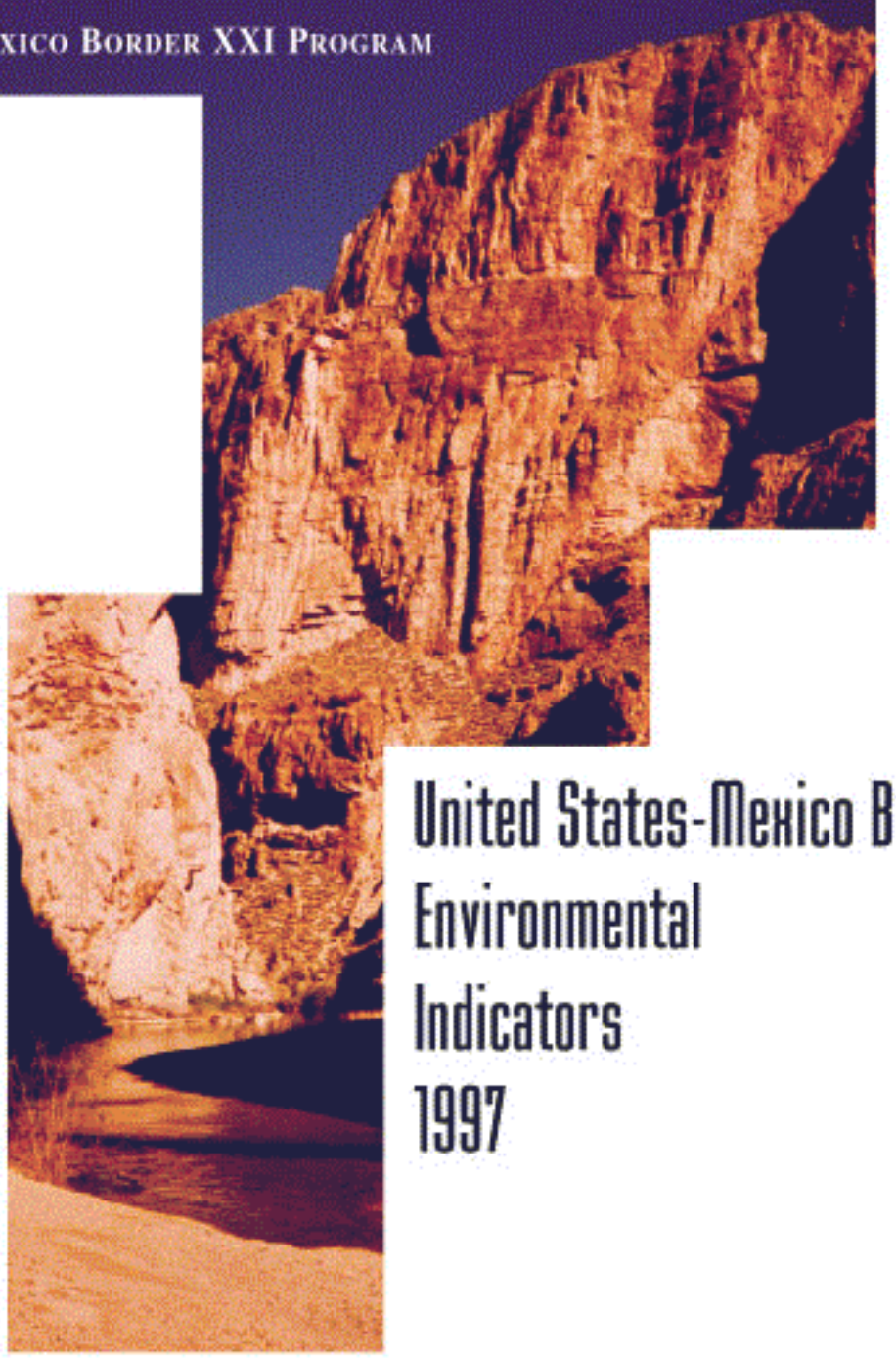
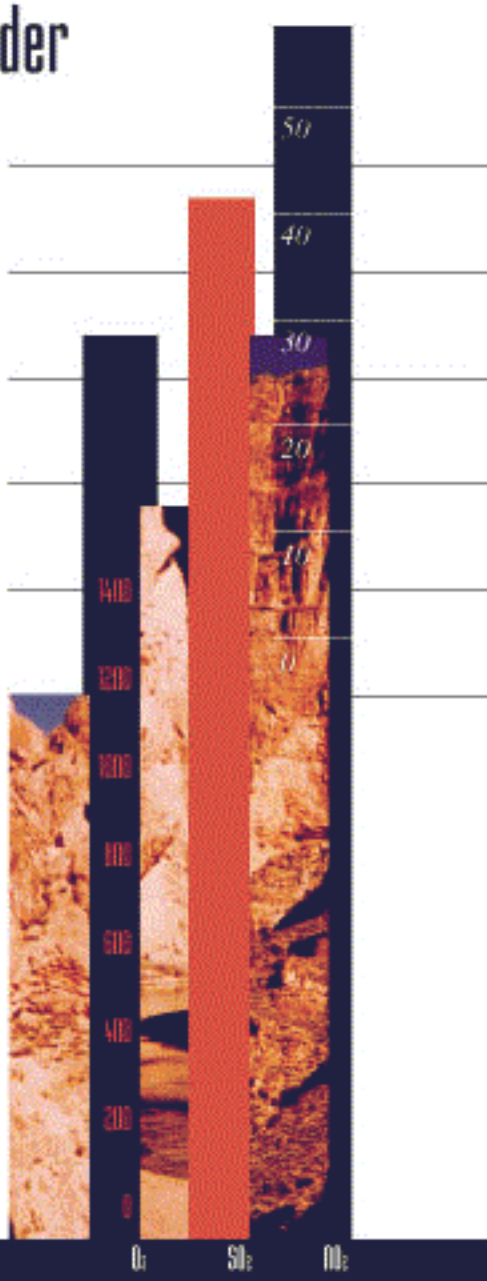
U.S.-Mexico Border XXI Program



United States-Mexico Border Environmental Indicators 1997



EPA909-R-98-001

The 1997 U.S.- Mexico Border Environmental Indicators Report

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Environmental Indicators
were Developed by the Border XXI Workgroups:

Air
Contingency Planning and Emergency Response
Cooperative Enforcement and Compliance
Environmental Health
Environmental Information Resources
Hazardous and Solid Waste
Natural Resources
Pollution Prevention
Water

Special thanks to Abraham Nehmad, Director of Border Affairs in the International Covenants and Agreements Unit of SEMARNAP, for organizing meetings to solicit public comment in the Mexican border states and workshops with the Border XXI Workgroups in Mexico.

Thanks also to Frank Schmidt, Jalayne McCune, Carmen Masó, Marie Martel, and Diana Uribe.

For more information about this publication and the Border XXI Program, please see the contact information listed on the back page.

This report was printed on recycled and recyclable paper with vegetable-based inks.

Key Federal Agencies Implementing Border XXI

Environmental Protection

U.S. Environmental Protection Agency
Mexican Secretariat for Environment, Natural Resources and Fisheries
Mexican Secretariat for Social Development

Border Water Resources

International Boundary and Water Commission
U.S. Department of the Interior
U.S. Environmental Protection Agency

Natural Resources

U.S. Department of the Interior
U.S. Department of Agriculture
Mexican Secretariat for Environment, Natural Resources and Fisheries

Environmental Health

U.S. Department of Health and Human Services
Mexican Secretariat of Health

Other important federal participants include the U.S.'s Department of State, National Oceanic and Atmospheric Administration, Agency for International Development, Department of Justice, Department of Transportation, Department of Energy, and Mexico's Secretariat of Foreign Relations, National Institute for Statistics, Geography, and Information, Secretariat of Interior (Civil Protection), Secretariat of Communication and Transportation, and Secretariat of Energy.

Contents

Introduction

The ecosystems, watersheds, and air basins that make up the environment and natural resource base of the border region transcend political boundaries. Regardless of where they originate, border environmental problems significantly impact communities and ecosystems on both sides of the border.

For many years, the United States and Mexico have been involved in formal and informal cooperative efforts to protect the environment and natural resources of our common border. In 1996, the Border XXI Program was initiated as an innovative binational effort to bring together the diverse U.S. and Mexican federal entities responsible for the shared border environment.

Under the Border XXI program, the United States and Mexico are working cooperatively toward sustainable development through protection of human health and the environment and proper management of natural resources in both countries.

Unsustainable practices in the border region have resulted in degradation of environmental conditions. Industrialization has brought important economic benefits to the border region. However, it has also been accompanied by accelerated population growth and unsustainable production and consumption that surpass the capacity of the natural resource base as well as that of basic infrastructure, particularly with regard to water resources. These conditions present a threat to biodiversity and air and water quality, and pose health risks to border residents.

The principal goal of the Border XXI Program is to promote sustainable development by seeking a balance among social and economic factors and the protection of the environment in border communities and natural areas. The federal governments of both nations are committed to working with their state and local counterparts and with residents of the border region to further define and realize the vision of sustainable development underlying Border XXI.

The 1996 Border XXI Framework Document defines five-year objectives for the border environment and describes mechanisms for fulfilling those objectives. One of the key objectives of the Framework Document is the development of environmental indicators to use in evaluating the effectiveness of border environmental policy. This report was prepared in response to that mandate, and marks the first time that the United States and Mexico have worked binationally to develop environmental indicators for the border area.

Given the challenges involved in developing indicators for the border area, this initial report contains a limited number of indicators. We will add more indicators and modify current indicators in future reports. As part of this process, we will continue to involve border communities, state and local agencies, tribal governments, concerned citizens and citizen groups, and industry and business groups.

Sustainable development "meets the needs of the present without compromising the ability of future generations to meet their own needs."

The World Commission on Environment and Development, Our Common Future, 1987.

Border XXI Workgroups

Workgroups Initiated in 1983

- Water
- Air
- Hazardous and Solid Waste
- Pollution Prevention
- Contingency Planning and Emergency Response
- Cooperative Enforcement and Compliance

Workgroups Added in 1996

- Environmental Information Resources
- Natural Resources
- Environmental Health

Nine binational Border XXI Workgroups developed the indicators in this report, with each workgroup addressing its particular Border XXI area of responsibility. The chapters in this report are organized by workgroup, and reflect the efforts made to date by the individual workgroups.

Each workgroup operates under the guidance of a U.S. and Mexican co-chairperson. Many of the workgroups have a long-standing history of binational cooperation, while others were formed in 1996 as the Border XXI Program was initiated. In addition, some types of environmental, human health, or natural resource areas are more readily measured than others. As a result, the number of indicators each workgroup was able to develop and obtain data for varies depending on the challenges it faced. All workgroups, however, have begun the process of developing indicators, and future reports will continue our commitment to evaluating the efforts of Border XXI on the border area.

Types of Environmental Indicators

Although we refer to all indicators in this report as environmental indicators, there are actually two types of indicators represented: environmental indicators and performance indicators. The nine workgroups engage in a range of activities to address border environmental, human health, and natural resource issues, and using both types of indicators allows us to provide a better picture of the results of our binational efforts in the border area.

This report defines indicators using the Organization for Economic Cooperation and Development (OECD) framework for organizing indicators. The tabs above the definitions appear with the indicators in this report to note in which of the three categories a particular indicator falls.

P PRESSURE INDICATORS

Pressure indicators are measures of pressure on the environment caused by human activities. An example is the amount of a particular stratospheric ozone-damaging pollutant emitted into the air by an industry, and is measured at the location where the pollutant is released into the environment.

S STATE INDICATORS

State indicators are measures of the quality of the environment and the quantity of natural resources, and include the health effects caused by the deterioration of the environment on human populations and ecosystems. An example is the concentration of a particular ozone-damaging pollutant in the air. Unlike the pressure indicator example above, which measures the amount of a pollutant emitted at the locations where it is released into the environment, a state indicator captures the concentration of a pollutant in the air, perhaps discharged by several industries and influenced by atmospheric and other factors.

R RESPONSE INDICATORS

Response indicators are measures of the efforts undertaken by society to respond to environmental changes and issues. An example is the amount of alternative substances substituted for ozone-damaging substances in a particular production process.

Using the OECD model allows us to evaluate environmental and human health conditions in the border area from a cause-effect or action-response perspective. For example, when we are addressing air pollution problems in the border area, we need to measure the amount of various types of pollutants being emitted into the air by different sources, the concentration of these pollutants in a particular air basin, and the amount of pollutants not being released into the air due to pollution control efforts.

In future reports, we plan to present the indicators in a manner that integrates pressure, state, and response indicators. This year, as a foundation for building toward this goal, we have identified each indicator as a pressure, state, or response indicator.

Environmental Indicators

Direct or indirect measures of environmental quality that can be used to assess status and trends in the environment's ability to support human and ecological health.

Examples:
Exceedances of the ambient standard for ozone.

Number of species at risk of extinction.

Performance Indicators

Direct or indirect measures of the achievement of the intended purpose of a program, expressed as either an environmental result or program activity.

Examples:
Number of children tested for blood lead levels.

Number of inspections conducted.

The Border

In 1983, the United States and Mexico signed the Agreement for the Protection and Improvement of the Environment in the Border Area (La Paz Agreement), which provided a formal foundation for cooperative environmental efforts. The La Paz Agreement defined the border region as the area lying 100 kilometers or 62.5 miles to the north and south of the U.S.-Mexico boundary.

At the start of this century, there were just over six million people living in the four U.S. and six Mexican border states. This figure has increased more than tenfold in the decades that have followed, with the population of these ten border states reaching over 65 million in 1990. In addition to rapid population growth, this century has seen greater numbers of people moving to cities. Less than a third of the border states' inhabitants lived in cities in 1900. As the twentieth century draws to a close, more than 90 percent of these states' populations live in urban areas.

The U.S.-Mexico border area is a 200-kilometer border zone that extends 100 kilometers or 62.5 miles on either side of the border and stretches 3,141 kilometers or 1,952 miles from the Pacific Ocean to the Gulf of Mexico. Many U.S. counties and Mexican municipalities are located entirely or partially in the 200-kilometer zone, and there are 39 Mexican municipalities, 25 U.S. counties and 14 pairs of sister cities adjacent to the international boundary line.

While the international boundary defines the political jurisdictions of two countries with distinct social, cultural and political features, the border area itself emerges as a space in which these differences converge and become less distinct. Some of the defining characteristics shared by border communities are the intense interrelationship between communities on both sides of the border; the rapidly growing population; the strong presence of new economic factors, such as maquiladoras, with a high social, economic, and environmental impact; and the constant transboundary movement of people, goods, and resources.

Population

The 200-kilometer border region is home to more than 10.5 million people, with about 6.2 million in the United States and 4.3 million in Mexico. Of the nearly 90 percent of the border inhabitants who live in urban areas, most live in sister city communities composed of a U.S. and Mexican city closely related by proximity, commerce, and shared resources. The sister cities are the main points of commercial and human transboundary movement and are the industrial centers of the region.

The region of California-Baja California, including the counties of San Diego and Imperial and the municipalities of Tijuana, Tecate, and Mexicali, makes up 44.5 percent of the total population in the border area, while the area of El Paso-Ciudad Juarez makes up 15.4 percent of the border area's total population. Most other parts of the border area are sparsely populated with several counties and municipalities having fewer than ten persons per square mile or approximately 4 persons per square kilometer.

Population growth on both sides of the border has been noticeably rapid, growing far faster than that of the population as a whole in either country. In the border area of Mexico, the growth rate is 3 percent. In the U.S. border area, the growth rate is 2.7 percent.

Combined Populations of Sister Cities

Over 3.5 million
San Diego–Tijuana

Over 1.5 million
El Paso–Ciudad Juarez

Over 150,000
Imperial County–Mexicali
Laredo–Nuevo Laredo
McAllen–Reynosa
Brownsville–Matamoros
Nogales–Nogales
Yuma–San Luis Rio Colorado

Between 1950 and 1980, the population of the Mexican border states tripled and that of the U.S. border states doubled. The birth rate in 1990 for the Mexican border states, 27.6 births per 1,000 people, was less than the national average of 32.2 births per thousand. However, the birth rate in the U.S. border states, 19.1 births per 1,000 people, is higher than the national average of 16 births per thousand. The differences in the birth rates in both regions may reflect cultural and economic differences between the border region and their respective countries, but also may reflect a common influence between the two communities.

The U.S. border area is more ethnically diverse than the rest of the country, with about 57 percent of the border population consisting of ethnic minorities, compared to about 20 percent in the U.S. population as a whole. Spanish is the dominant language of many U.S. border communities.

Life expectancy in the Mexican border area is higher than the national average. In 1992, life expectancy in the Mexican border states was 70.3 years. In the U.S. border area, life expectancy in 1990 was 75.4 years, almost the same as the U.S. national average of 75.5 years (1992). Mortality rates in the Mexican and U.S. border states are slightly lower than their respective national averages. However, in border municipalities with a large migratory influx, there is a high rate of infant mortality.

Despite recent setbacks in the Mexican economy, expected long-term economic growth in the border region is likely to stimulate continued rapid population growth in the area. Current population projections forecast a doubling of the border population over the next 20 years.

Income, Employment, and Quality of Life

The six Mexican border states have poverty rates considerably below the national average, with the exception of Tamaulipas, which has a rate closer to the national average. These Mexican border states also tend to have a more uniform income distribution than Mexico as a whole. At the municipal level, this equity in income distribution is even more evident. However, these communities confront deficiencies in the provision of basic services and have more unmet needs than the national average.

The U.S. border population, on the other hand, tends to be poorer than the rest of the country, with more than 20 percent living below the poverty level as compared to 12 percent in the country as a whole. While only about eight percent of San Diego, California's population is below the poverty line, in Starr County, Texas, about 55 percent of the population lives in poverty. Three of the ten poorest counties in the United States are located in the border area and 21 U.S. border communities have been designated as economically distressed.

In terms of employment, in Mexico many of the manufacturing jobs and associated service jobs reflect the effect of Mexico's maquiladora program which was created in the mid-1960s. The program grew significantly during the 1980s as a result of Mexico's peso devaluation, which lowered salaries and made industrial development on the Mexican side of the border attractive.

Colonias

Colonias are U.S. rural settlements with substandard housing and poor living conditions along the U.S.-Mexico border. Colonias are found mostly in New Mexico and Texas. It is estimated that over 390,000 people in Texas and 42,000 people in New Mexico live in such settlements. These communities often lack basic services of potable water, wastewater treatment, drainage, electricity, and paved roads. The federal government and the states of Texas and New Mexico have undertaken steps and are exploring new ways to address the problems of colonias.

An increase in maquiladoras also occurred in 1995 because of the 1994 peso devaluation. From fewer than 100 maquiladoras nationwide in the 1960s, by July 1997, there were more than 2,700 businesses employing more than 900,000 workers, with over 1,700 maquiladoras located in the northern border area of Mexico (around 731,000 employees). These industries represent the second largest source of export earnings in Mexico. The largest concentrations of maquiladora plants are in Tijuana, with 605 plants employing 140,000 employees, and Ciudad Juarez, with 302 plants employing more than 190,000 people.

In both countries, the percentage of the population engaged in agriculture is generally lower than in the rest of the country, although in a few border counties, primarily in the lower Rio Grande area and Imperial County, California, agriculture is important.

Many border area residents are exposed to health-threatening levels of air pollutants, including carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate matter with an aerodynamic diameter of 10 micrometers (µm) or less. The need to evaluate levels of targeted air pollutants is particularly urgent in heavily populated urban areas, where air quality problems are compounded by emissions from increasing numbers of vehicles, many of which are older and poorly maintained; extensive industrial activity; and numerous other sources, such as unpaved roads and waste disposal fires. As part of the La Paz Agreement and the Border XXI Framework Document, Mexico and the United States have agreed to work cooperatively to address these environmental concerns. In order to promote regionally-based air quality management programs, the Air Workgroup continues to build on the efforts of its sub-workgroups.

For this year's report, the Air Workgroup looked at the following pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter with an aerodynamic diameter of 10 µm or less.

Other pollutants and other indicators may be added to the list of air environmental indicators at a later time. Once the air monitoring networks and emissions inventories are completed in each priority area, the air sub-workgroups can model the effects of mobile, area, and point sources to apportion pollution to the different air pollution contributors. When the apportionment is complete, the air sub-workgroups can determine which control strategies will best reduce air pollution and can use the indicators as a measure of progress towards better air quality and to determine environmental trends. These trends will be captured by graphical representations of annual data for each criteria pollutant in each sister city in terms of ambient concentrations, exceedances, and apportionment.

Indicators

S

STATE INDICATORS

Ambient air concentrations for the criteria pollutants in each sister city.

Areas that have exceedances of ambient air standards.

Number of exceedances of each ambient air standard.

U.S. and Mexican ambient air standards for the pollutants measured in this report are listed in the table on the next page. The data represented below are taken from the U.S. Environmental Protection Agency's Airometric Information Retrieval System (AIRS), the U.S.-Mexico Center on Air Pollution (CICA), and the Mexican National Institute for Ecology (INE). The data in AIRS contain air monitoring data directly collected by the state and local agencies and have been quality assured based on U.S. Environmental Protection Agency (EPA) guidelines. In addition, the data collected in the border region were collected in joint collaboration between the United States and Mexico.

Additional ambient air information for cities in the United States is available to the public through EPA's AIRS database. Binational air information is also available in AIRS and on the CICA and INE Internet pages (see the Internet Sites listing on page 43). A 1996 Mexican report, The First Report on Air Quality in Mexican Cities, also provides important air quality information.

The data for these three indicators are presented by sister city groupings. For Nogales, Arizona–Nogales, Sonora, there were no exceedances of PM-10, the only air pollutant selected for monitoring. No data are available for the sister cities of Douglas, Arizona–Agua Prieta, Sonora or Yuma, Arizona–San Luis Rio Colorado, Sonora. There are no monitoring stations installed in these locations, although stations are planned for Douglas, Arizona, and Agua Prieta, Sonora, by the end of 1998.

Health-Based Ambient Standards

POLLUTANT	Mexico UNITS	Mexico AVERAGE	United States UNITS	United States AVERAGE
Ozone	0.11 ppm	1 hour	0.12 ppm	1 hour
Sulfur Dioxide	0.13 ppm 0.03 ppm	24 hours Annual*	0.14 ppm 0.03 ppm	24 hours Annual*
Nitrogen Dioxide	0.21 ppm	1 hour	0.25 ppm 0.053 ppm	1 hour Annual*
Carbon Monoxide	11 ppm	8 hours	9 ppm 35 ppm	8 hours 1 hour
TSP**	260 ug/m^3 75 ug/m^3	24 hours Annual*		
PM-10	150 ug/m^3 50 ug/m^3	24 hours Annual*	150 ug/m^3 50 ug/m^3	24 hours Annual*
Lead	1.5 ug/m^3	3 months*	1.5 ug/m^3	3 months*

* arithmetic mean
**Total Suspended Particulate

EPA has revised the particulate matter and ozone standards, so this table may be revised at a later time. The revisions include the use of a new PM-2.5 standard and a new ozone standard. With these new proposed standards, EPA has also modified the method for determining if an area should be re-designated to non-attainment status (i.e., the extent of the exceedances rather than the frequency of the exceedances).

EPA has also published a standard for regional haze. The regional haze standard makes use of a deciview to determine improvement of visibility. However, with it, the new PM-2.5 standard is also linked as an indicator to visibility impairment or regional haze

At this time, the binational environmental indicators for this Border XXI report will be limited to the standards that are similar. U.S., state, and local air pollution control agencies will begin implementing the new standards in the next few years. Once these agencies begin to gather data based on the new standards, the Air Workgroup will begin discussions on creating air indicators and generating data for the Border XXI program based on these new standards.

The standards in this table were established to protect people from adverse effects associated with pollutants. Some pollutants, such as PM-10 and sulfur dioxide, have standards for both long-term (annual) and short-term (24 hours or less) averaging times. Short-term standards protect people from adverse health effects associated with peak short-term exposure to air pollution, while long-term standards protect people from adverse health effects associated with short- and long-term exposures to air pollution.

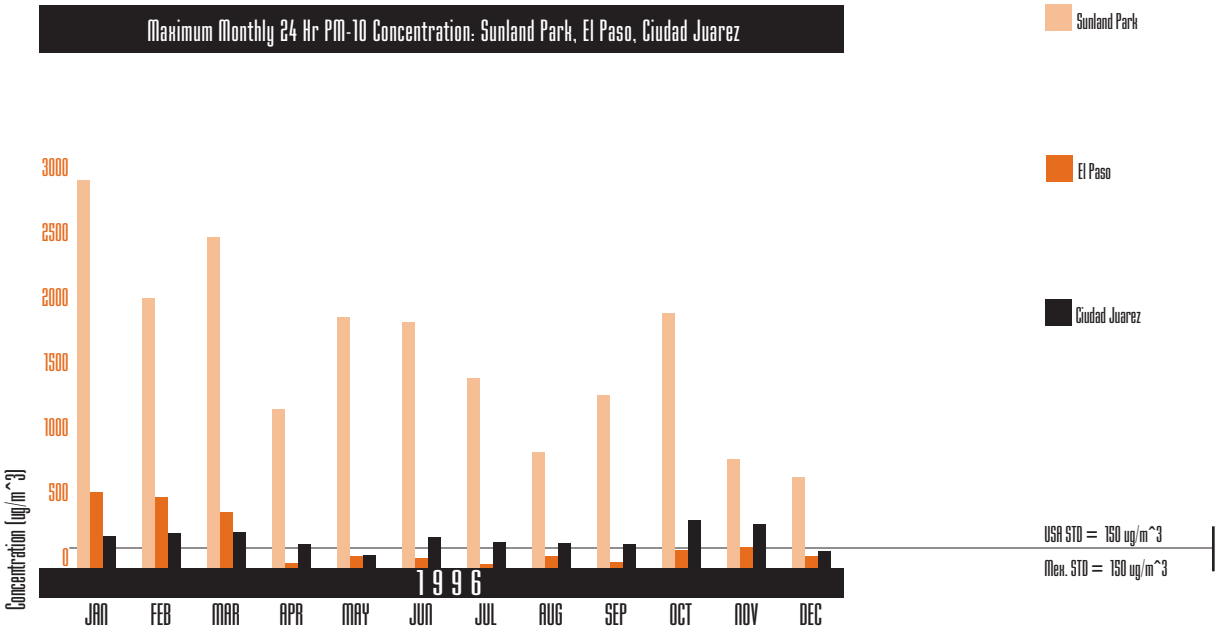
Carbon Monoxide (CO)

Carbon monoxide is an odorless and colorless gas produced through the incomplete combustion of carbon-based fuels. Other sources of carbon monoxide include industrial processes and other fuel combustion.

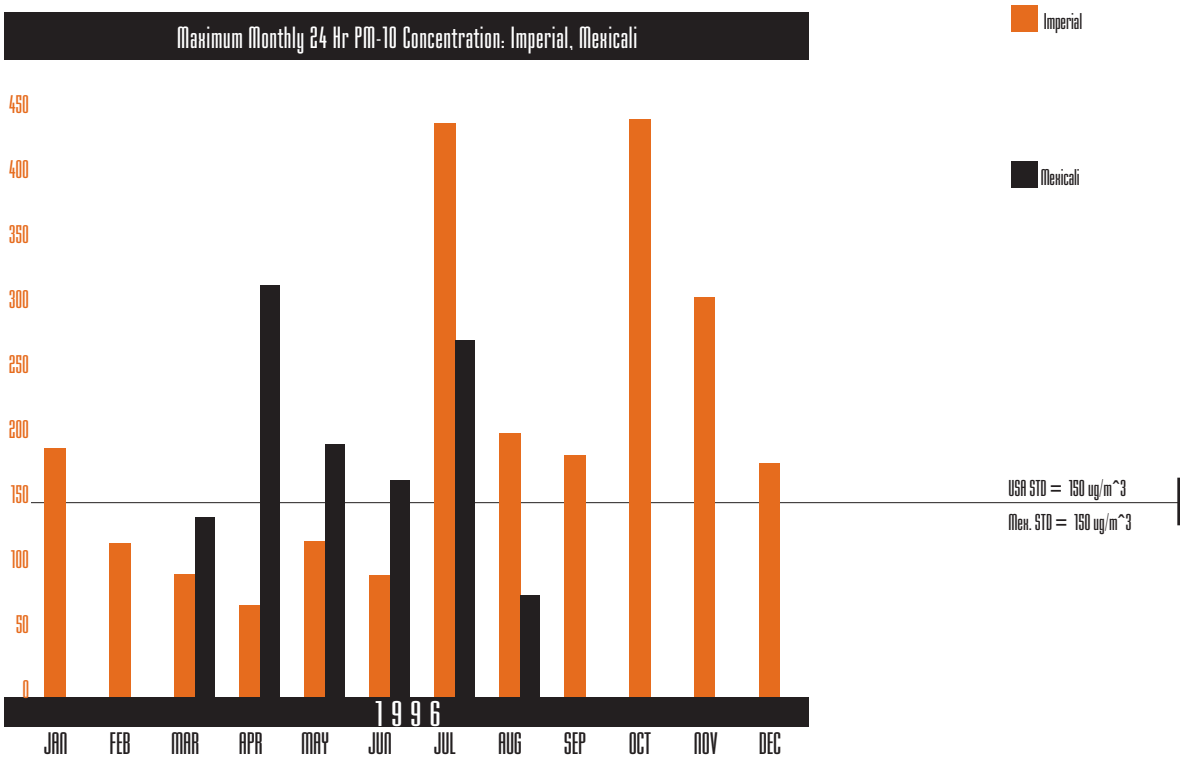
Elevated levels of carbon monoxide can be found in metropolitan areas with high traffic congestion. Ambient concentrations of carbon monoxide are highest during the winter months, when automobile "cold starts" contribute to more incomplete combustion. Carbon monoxide binds to the hemoglobin in the blood, reducing the oxygen carrying capacity of the blood delivered to tissue and organs. Exposure to carbon monoxide is a human health risk for individuals suffering from cardiovascular diseases. Elevated levels of carbon monoxide are associated with visual impairment, reduced work capacity, and lethargy.

Sulfur Dioxide (SO_2)

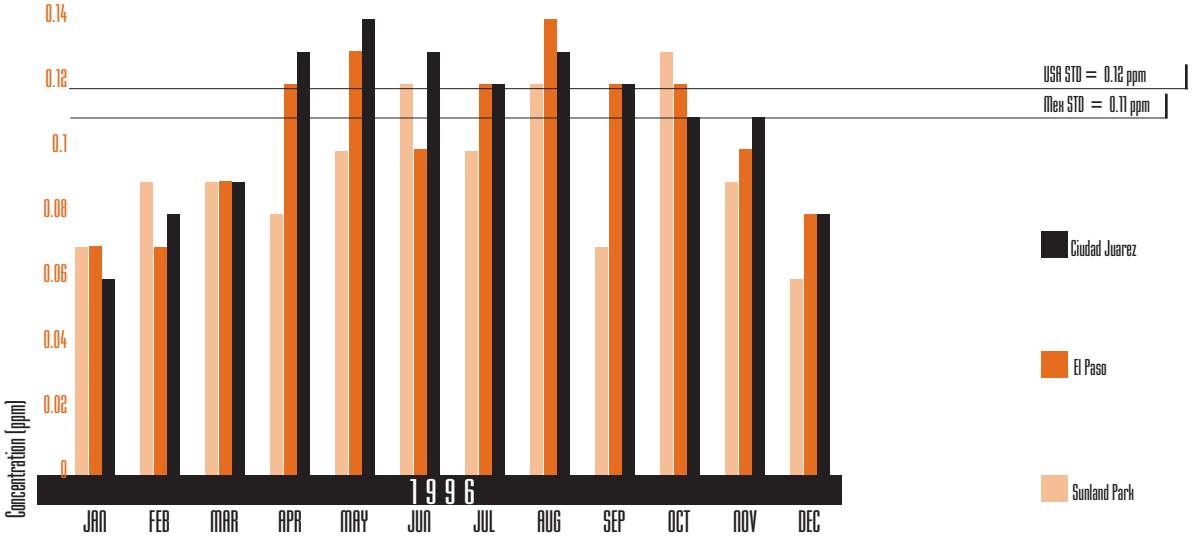
Sulfur dioxide is a gas emitted through the combustion of fuel containing sulfur. Sources include electric utilities, metal smelting and other industrial sources. Elevated concentrations of sulfur dioxide may aggravate pulmonary and cardiovascular diseases, such as bronchitis or emphysema. Sulfur dioxide combining with nitrogen dioxide leads to the formation of acid rain, which is associated with the acidification of lakes and streams, reduced visibility, and the deterioration of buildings and agricultural crops.



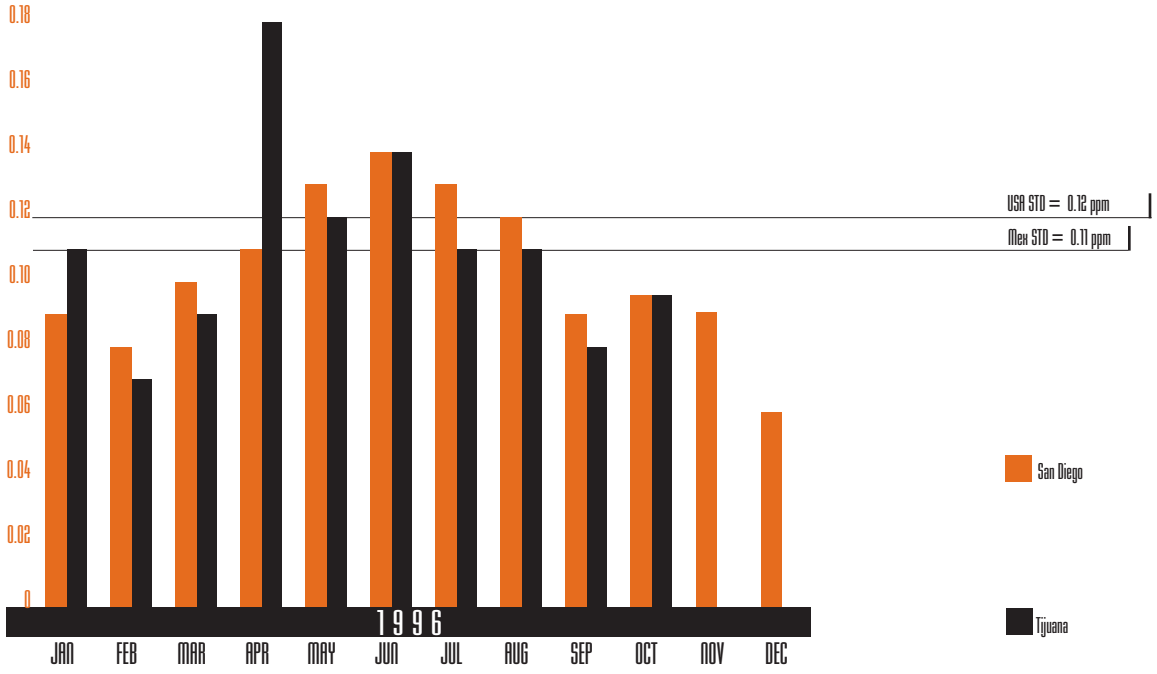
Note: Sunland Park suffers from severe dust storms.



Maximum Monthly 1 Hr Ozone Concentration: Sunland Park, El Paso, Ciudad Juarez



Maximum Monthly 1 Hr Ozone Concentration: San Diego, Tijuana



Border Cities that Exceed or Potentially Exceed Ambient Air Quality Standards

Border Non-Attainment Areas*	PM-10	SO_2	CO	O_3
United States				
El Paso, Texas	•		•	•
Dona Ana County, New Mexico	•			•
Imperial County, California	•		**	***
San Diego, California			•	•
Douglas, Arizona	•	•		
Nogales, Arizona	•			
Yuma, Arizona	•			
Mexico				
Tijuana, Baja California	•		•	•
Mexicali, Baja California	•		•	•
San Luis Rio Colorado, Sonora	•			
Nogales, Sonora	•			
Agua Prieta, Sonora	•	•		
Ciudad Juarez, Chihuahua	•	•	•	

* Mexico considers an area as not in compliance when it exceeds one of the air quality standards. This table lists Mexican cities that potentially do not meet Mexican air quality standards based on knowledge of sources and their potential emissions.

** Currently designated as "unclassifiable/attainment," although last year there were 11 violations. Based on 1994-1995 data, the design value would be 12.9 ppm ("high" moderate).

*** Currently designated as "transitional" non-attainment for ozone. Based on 1993-1995 data, the county's design value would likely be 0.16 ppm or higher (serious).

Note: This table, prepared for the 1996 Border XXI Framework Document, lists the cities that exceed or potentially exceed the national ambient air quality standards of the respective country. This table does not reflect information collected in 1996.

Nitrogen Dioxide (NO_2)

A stifling, brownish gas, nitrogen dioxide is one of several highly reactive gases that belong to the group of nitrogen oxides. Prolonged exposure to high concentrations of nitrogen dioxide may increase the incidence of respiratory infection. Nitrogen oxides combined with volatile organic compounds react with oxygen in the air and in the presence of sunlight to form ground level ozone.

Ozone can restrict bronchial passages and exacerbate conditions for those individuals suffering from respiratory illnesses. Nitrogen oxides are also a contributor to acid rain, which can accelerate the corrosion of buildings and monuments and result in the acidification of lakes and streams.

Ozone (O_3)

Ground-level ozone is not emitted directly into the atmosphere, but derives from reactions between nitrogen oxides and volatile organic compounds stimulated by meteorological conditions, such as sunlight and temperature. Common sources of nitrogen oxides and volatile organic compounds include motor vehicle exhaust, chemical solvents from dry cleaners, and fossil fuel combustion from industrial facilities. These photochemical reactions often occur hundreds of miles from the source and are sensitive to variability in meteorological conditions. Peak ozone concentrations generally occur during hot, dry, stagnant summertime conditions.

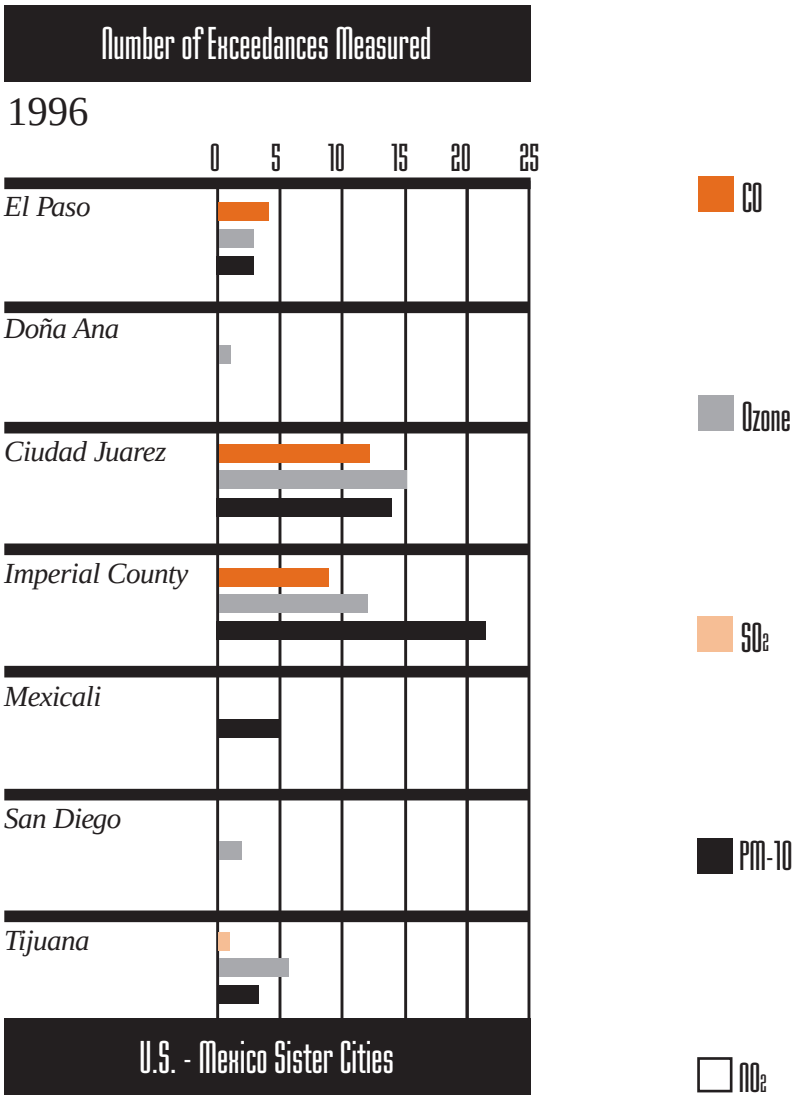
In the United States, approximately 27.1 million children aged 13 and under and 1.9 million children with asthma reside in areas that experienced unhealthy levels of ozone pollution at least four times during 1991 to 1993.

American Lung Association,
Danger Zones: Ozone and Our Children,1995.

High concentrations of ground-level ozone are a significant human health and environmental concern. Ozone is a pulmonary irritant that induces respiratory inflammation accompanied by symptoms such as coughing, chest pain, and pulmonary congestion. High levels of ozone can cause damage to foliage in many crops and tree species and are responsible for losses in agricultural crops. Elevated ozone concentrations may also cause foliar damage and reduced photosynthesis to forest ecosystems.

Particulate Matter (PM-10)

Particulate matter is a term for liquid or solid particles present in the air. Particles range in size from 0.01 microns to 10 microns and vary widely in chemical and physical composition. Fugitive emission sources of



particulate matter include dust from roads, agricultural activities, construction and mining activities, wildfires, and open-burning. Exposure to PM-10 can have adverse health effects on respiratory systems. Small particles are inhaled and deposit in the lungs causing tissue damage. Chronic diseases include emphysema. bronchitis, and cardiovascular complications as a result of lung damage. Children, the elderly and individuals with pre-existing respiratory diseases are most susceptible to these health risks.

Indicator in Progress

P

PRESSURE INDICATORS

Emissions of pollutants.

Data for this indicator will be collected when emissions inventories for the sister cities are created. At this time, the Air Workgroup is working to generate emissions inventories for the El Paso-Juarez-Dona Ana air basin and for the Mexicali-Calexico sister cities.

In addition, the Air Workgroup, through the Arizona Department of Environmental Quality, has created an air emissions inventory for the sister cities of Nogales, Arizona and Nogales, Sonora. The report is expected to be completed in early 1998. Other sister city emissions inventories will be developed after the completion of the emissions inventories currently in progress.

Contingency Planning and Emergency Response

The fundamental purpose of the Contingency Planning and Emergency Response Workgroup is to increase municipal and local capacity to prepare for and respond to hazardous material emergencies and optimize the use of U.S. and Mexican resources in environmental emergencies. The workgroup coordinates binational activities through the Joint Response Team, which assists state and local officials and the public in the development of joint sister city plans in order to be better prepared to mitigate the effects of chemical accidents along the border. This work is being accomplished by providing support to the border cities to identify the hazardous chemical risks present in their community and reduce those risks.

Indicator in Progress

R

RESPONSE INDICATORS

Number and location of industries along the border posing risk that have coordinated emergency response plans.

Facilities with hazardous chemicals run the risk of having chemical accidents that could affect surrounding communities. These facilities, therefore, are the first line of defense in mitigating the effects of a chemical accident, should one occur. Having an emergency response plan provides for initial protection for communities from the effects of a chemical accident.

It is expected that the following sectors will be included in this indicator: electric power generators, refineries, chemical industry, metallic and nonmetallic minerals, vegetable and animal products, wood and derivatives, food processing, textile industry, and distribution and storage of liquid petroleum gas.

By 1999, information on industries along the U.S. border posing risk will be available. The Clean Air Act of 1990 requires facilities that pose hazardous materials risks to develop and submit Risk Management Plans to EPA. These plans will be placed in a computer database system that the public can access, and will include information on the amount and location of hazardous chemicals at the facility, a history of the chemical accidents that have occurred at the facility in the last five years, and a description of the worst-case accident that could occur at the facility.

Indicator in Progress

R

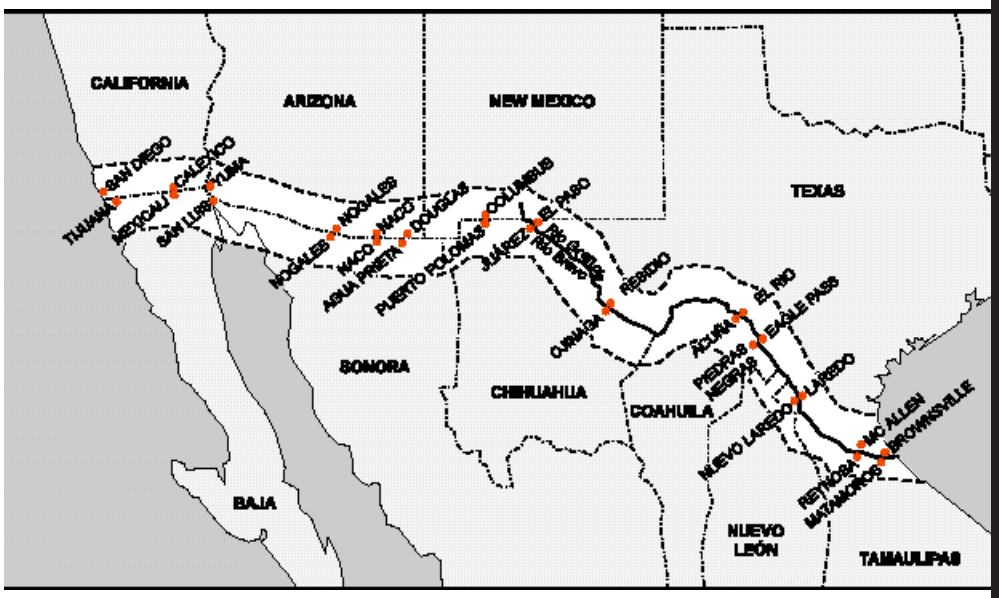
RESPONSE INDICATORS

Number of organizations capable of responding to chemical emergencies along the border, by state and locality or municipality.

Participants in an emergency response exercise in El Paso, Texas, conducted as part of the U.S.-Mexico joint training program.

When local communities lack the capability to respond to chemical accidents, state or federal responders need to be deployed to such accidents, resulting in potential delays in mitigating the incidents and preventing additional harm to the community and the environment.

The Contingency Planning and Emergency Response Workgroup has begun surveying hazardous materials response teams this year, and expects to have data for this indicator in 1998.



Indicator in Progress

R

RESPONSE INDICATORS

Number of sister cities with Local Joint Plans.

Sister cities must be prepared to respond quickly and effectively when a chemical accident occurs in order to mitigate devastating human health and environmental effects. Although these cities are in different countries, they share a common border and must, therefore, work together to combine their resources and protect their communities from the risks associated with chemical accidents. Creating a sister city plan prepares sister cities for such accidents, and identifies ways to reduce risks and prevent chemical accidents.

A Local Joint Plan is a document that describes the organization of available actions, people, services, and resources for response during a disaster. The plan is based on risk identification, available human and material resources, level of community preparedness, and local response capabilities. It also establishes the hierarchical and functional structure of the authorities and organizations working during the emergency in the context of the relationship between two border cities.

In 1998, Local Joint Plans will be developed for the four sister cities currently developing plans, which are listed here.

Sister Cities with Local Joint Plans

Brownsville, Texas — Matamoros, Tamaulipas

Sister Cities Developing Local Joint Plans

Laredo, Texas — Nuevo Laredo, Tamaulipas

Del Rio, Texas — Ciudad Acuña, Coahuila

Eagle Pass, Texas — Piedras Negras, Coahuila

El Paso, Texas — Ciudad Juarez, Chihuahua

Indicator in Progress

S

STATE INDICATORS

Number of border area accidents of record per year, classified by type, frequency, and hazardous substance.

The type of accident that will be measured by this indicator includes any dangerous event that occurs due to the handling of hazardous substances, such as spills, leaks, fires, or explosions, and which cause temporary or permanent damage to the environment, human health, or property. In the United States, this information is captured on the Emergency Response Notification System, which records the type and quantity of the chemical involved; the date, time, and location of the accident; the date and time of the response efforts; and the type of response and mitigation efforts.

It is expected that U.S. and Mexican data for this indicator will be available in 1998. While data are available for some states or geographic regions, information for the entire border area is incomplete.

Cooperative Enforcement and Compliance

Laws for protecting human health and the environment are effective only when regulated entities comply. Enforcement of those environmental requirements, through inspections, negotiations, and legal action, is intended to assure compliance. Besides protecting human health and the environment through directly ensuring that environmental laws and regulations are followed, enforcement and compliance assurance contribute indirectly through the deterrent effect, building credibility for environmental requirements, and ensuring fairness among the regulated community.

The data for the following indicators were obtained from the General Directorate of Technical and Industrial Assistance of Mexico's Federal Attorney General for Environmental Protection (PROFEPA—Procuraduría Federal de Protección al Ambiente), and EPA's Integrated Data for Enforcement Analysis system and Case Conclusion Data Sheets.

Indicator

R

RESPONSE INDICATORS

Number of inspections conducted in the border area.

This is an enforcement activity indicator, a measure of the deterrent presence of regulatory agencies in the border area. Conducting facility inspections is one of the basic enforcement measures used to assure compliance.

Indicator

R

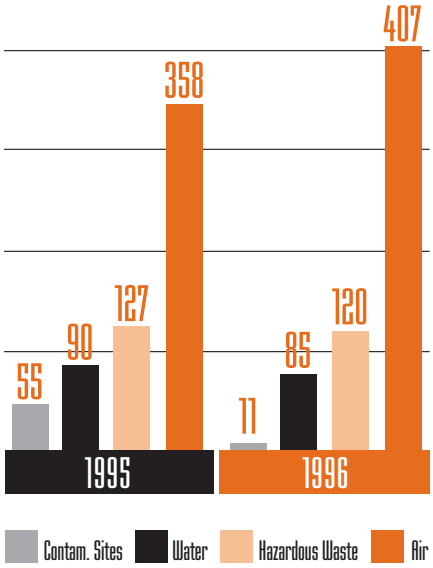
RESPONSE INDICATORS

Number of enforcement actions and penalties in the border area.

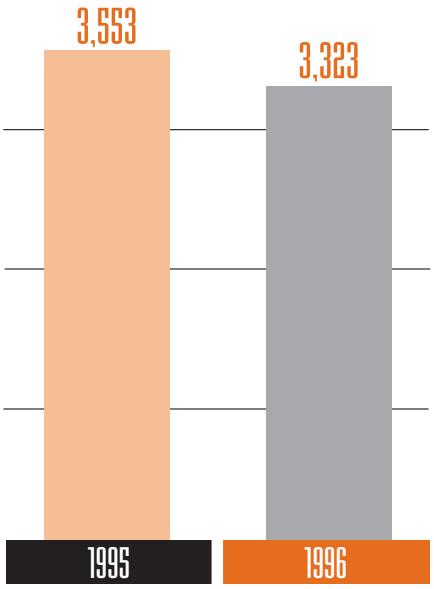
This indicator measures legal actions taken in the border area by the United States.

Knowing the "cop is on the beat" affects even those facilities not inspected.

Number of Inspections in the Border Area of the U.S.

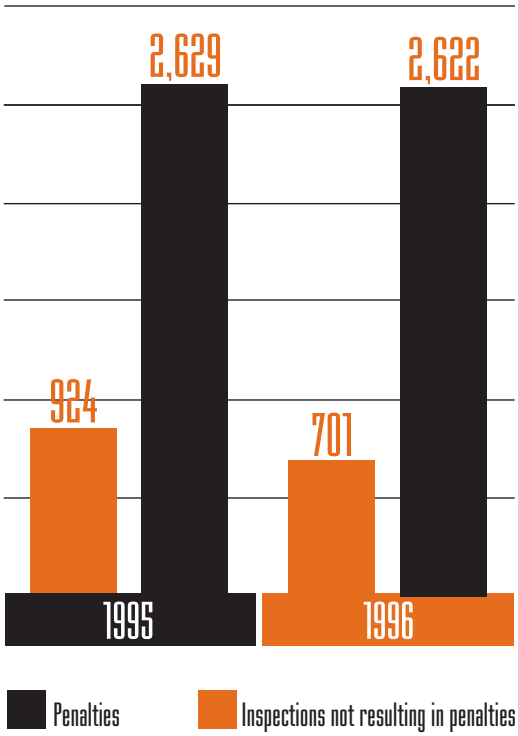


Number of Inspections in the Border Area of Mexico*

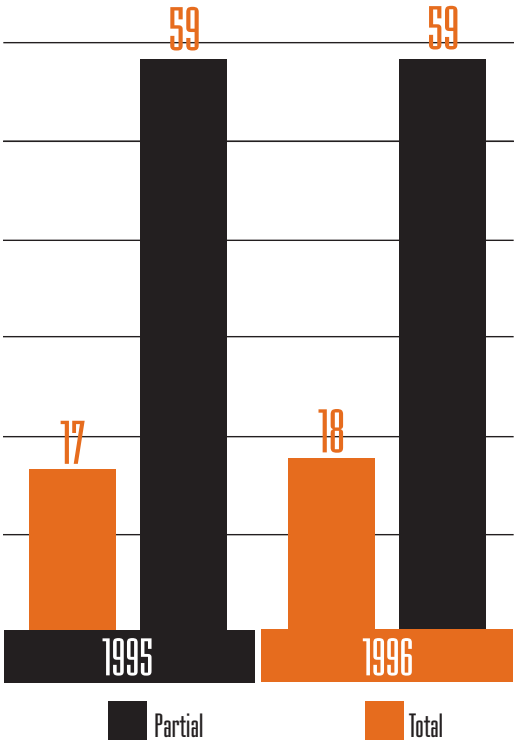


* Data for Mexico are not reported by category.

Enforcement Actions in Mexico: Penalties in the Border Area

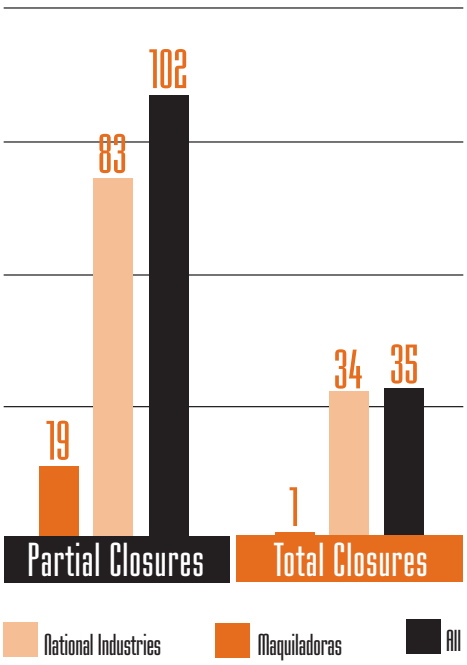


Enforcement Actions in Mexico: Closures in the Border Area



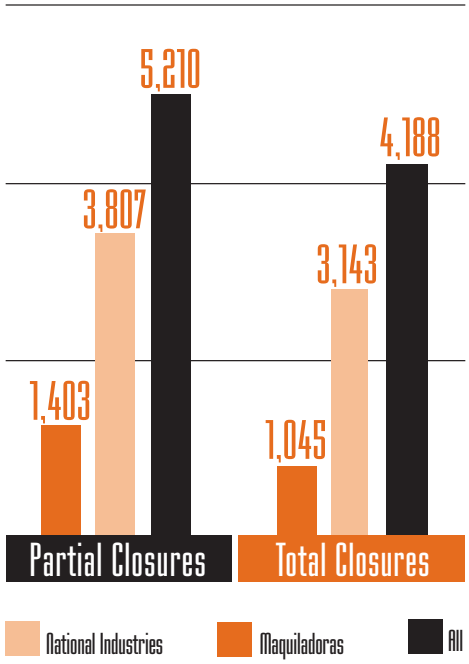
Closures in Mexico's Border Area

January 1996 - July 1997



Inspections and Penalties in Mexico's Border Area

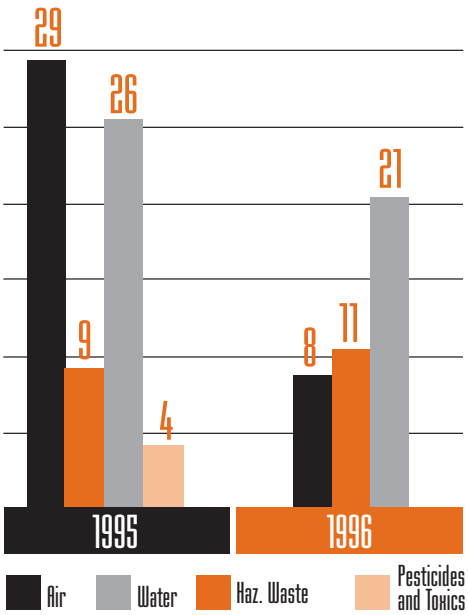
January 1996 - July 1997



Enforcement Actions in the U.S.: Penalties in Border Area

	1995	1996
Air	$171,225	$307,075
Hazardous Waste	$85,991	$2,008,214
Water	$10,000	
Pesticides and Toxics	$600	

Number of Enforcement Actions in the U.S. Border Area



Indicator

R

RESPONSE INDICATORS

Amount of money spent on injunctive relief and Supplemental Environmental Projects in the U.S. border area.

This indicator measures direct investment in the environment by the regulated community in the United States as part of a U.S. initiative. Supplemental Environmental Projects (SEPs) are environmentally-beneficial projects agreed to in enforcement case settlements in exchange for penalty reductions, and go beyond simply complying with the regulations.

Supplemental Environmental Projects in the U.S. Border Area

Number of Projects	6	1995 - 1996
Dollar Value	$295,966	

The amount of money spent on injunctive relief includes funds applied to address pollution, such as pollution control equipment. The amount of money spent on SEPs provides a dollar value for an action designed to increase human health or worker protection, ecosystem protection, environmental restoration, or increased public awareness.

Indicator

R

RESPONSE INDICATORS

Amount of pollution reduced as a result of enforcement.

This indicator measures the amount of pollutants not emitted to the environment as a result of enforcement actions in the United States. Although not a direct measure of improvements to ambient environmental quality, the reduction in pollutants provides some measure of the contribution of enforcement actions to a cleaner environment.

Amount of Pollution Reduced in the U.S. Border Area

6,640,000 Kilograms	1996

Environmental Health

Childhood lead exposure in Tijuana, Baja California has many sources, including lead-glazed pottery used for cooking and food storage. FONART (Fondo Nacional para el Fomento de las Artesanías) donated the lead-free pottery shown here, which will be given at no cost to families whose children have elevated lead levels.

The border region is confronted with a number of serious public health problems that are or may be associated with toxic environmental exposure. Contamination of air, water, and soil by hazardous materials and waste, pesticides, nitrates, raw sewage, untreated wastewater, parasites, or bacteria are suspected to be key factors contributing to the presence of certain diseases in the populations residing along the border. These diseases include asthma and tuberculosis; elevated blood lead levels in children; multiple myeloma, a form of bone-marrow cancer; systemic lupus erythematosus, an autoimmune disorder; hepatitis A; infectious gastrointestinal diseases such as shigellosis and amebiosis; and pesticide poisonings.

The mission of the Environmental Health Workgroup is to improve the environmental health of U.S.-Mexico border communities by identifying and addressing those environmental conditions that pose the highest human health risk. To accomplish this mission, workgroup activities are conducted in four inter-related program areas: Research to Link Environmental Exposures and Health Risks, Training and Education, Environmental Monitoring and Assessment, and Communications.

In 1996, planning was begun for seven initiatives, which are listed on the next page in four boxes by program area. Implementation of several of these initiatives is underway, as well as an evolving dialogue on appropriate environmental indicators. Since extensive databases do not exist for any of these initiatives, the proposed indicators must be considered preliminary.

Environmental pollutants, such as lead and pesticides, are one of many factors that may cause illness or result in death. The above activities, in and of themselves, cannot eliminate disease; however, the methods and data generated can contribute to more effective health promotion and risk reduction strategies. Success of each of the seven initiatives will be measured by process indicators (such as the amount of tools created and information gathered) that enhance decision making by public health and environmental officials in conjunction with the impacted communities.

Research to Link Environmental Exposures and Health Risks

Initiatives:

Pesticide and Adverse Health Effects in Young Children

Geographic Information System for Environmental Health

Indicator in progress

R — RESPONSE INDICATORS

Percent reduction in total pesticide exposure and number of children impacted in the border area.

Indicator in progress

S — STATE INDICATORS

Number of maps linking geographic information (e.g., land use) to health events or high risk groups.

Training and Education

Initiatives:

Advanced Training

Toxicology and Poison Control Center Development Program

Indicator in progress

R — RESPONSE INDICATORS

Number of people receiving advanced training and the number of projects initiated in the border area.

Indicator in progress

R — RESPONSE INDICATORS

Number of Poison Control Centers in operation and the number of people who have received formal training specifically for the border area.

Environmental Monitoring and Assessment

Initiatives:

Pediatric Lead Exposure and Risk Reduction

Neural Tube Defects

Indicator in progress

S — STATE INDICATORS

Prevalence of specific health effects in the border area, such as elevated blood lead levels or neural tube defects, and number of exposure sources or risk factors identified for intervention.

Communications

Initiative:

Health Alert and Disease Outbreak Information Exchange

Indicator in progress

R — RESPONSE INDICATORS

Number of border area organizations linked into and using the Health Alert and Disease Outbreak Information Exchange, and a measurement of the effect of "alert" in early intervention in suddenly emerging health risks.

Environmental Information Resources

The Environmental Information Resources Workgroup manages border information, encourages horizontal linkages, and works with the other Border XXI Workgroups to institutionalize effective communication and information sharing. In addition to producing this environmental indicators report, the Environmental Information Resources Workgroup is implementing or overseeing a number of other projects, from collecting and organizing geospatial data to expanding public access to border-related environmental and human health information. Since many of these activities do not have results that can be meaningfully counted, indicators were only developed for two projects, the U.S.-Mexico border homepage and the Geographic Information System work. Summaries of other important activities of this workgroup are provided below.

PUBLIC ACCESS TO INFORMATION

The Environmental Information Resources Workgroup is addressing the need for increased public access to a wide variety of environmental information by providing information on Border XXI through the Internet, Border XXI repositories, and the U.S.-Mexico Border toll-free telephone line, and by developing a comprehensive inventory of existing environmental data and information.

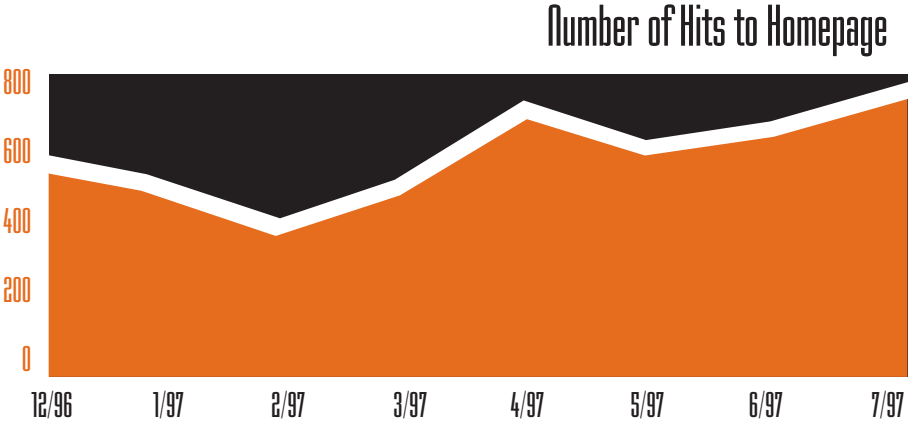
Indicator

S

STATE INDICATORS

Number of hits to the Border XXI Internet Homepage.

A "hit" is registered each time a person accesses an Internet webpage. Although the number of hits to the Internet homepage for border activities is tabulated here, the main goal of the homepage is to provide increased access to information about the border, rather than receiving a specific number of hits. These data were provided by EPA's Research Triangle Park office.



Environmental Inventory

The EcoWeb environmental inventory is a multi-year project that will address the growing need for public access to environmental information in border communities. Public citizens, schools, students, researchers, and governmental and non-governmental organizations are expected to be the primary users of this information. The EcoWeb is expected to include a comprehensive inventory of existing accessible environmental data and information and a directory with descriptions of projects and points of contact at Federal, state, local, and international agencies, and other sectors involved in border environmental activities. The EcoWeb will be produced in both Spanish and English, and will be posted on the Border XXI homepage. The project is expected to be completed in early 1999.

Outreach

The Environmental Information Resources Workgroup has initiated a number of outreach activities in the United States and Mexico to provide information to border communities and residents and to solicit feedback from the communities.

In the United States, EPA has established a toll-free telephone number (1-800-334-0741) that border residents can use to order Border XXI documents or to talk directly to Border Office staff in El Paso, Texas and San Diego, California.

EPA has established 25 repositories in border communities in the United States, which it supplies with relevant information about Border XXI. Location information for these reposities can be obtained by calling the toll-

free Border Office telephone number above. In Mexico, three information centers are planned for Tijuana, Ciudad Juarez, and Matamoros.

Environmental Education

The Environmental Information Resources Workgroup is working to identify the environmental education needs of border communities in the United States and Mexico through the creation of two cooperative agreements and a Border Environmental Education Resource Guide for Arizona, California, Baja California, and Sonora.

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

The spatial databases that are available for the border region vary in detail for every geographic region, and compatibility across the international and local borders is not consistent. In response, the GIS subworkgroup is taking a number of steps to resolve these problems. The databases created from the aerial photography project will build the foundation for subsequent binational digital mapping efforts and for populating the geographic information system. The data for the GIS indicators here were compiled by the United States Geological Survey (USGS).

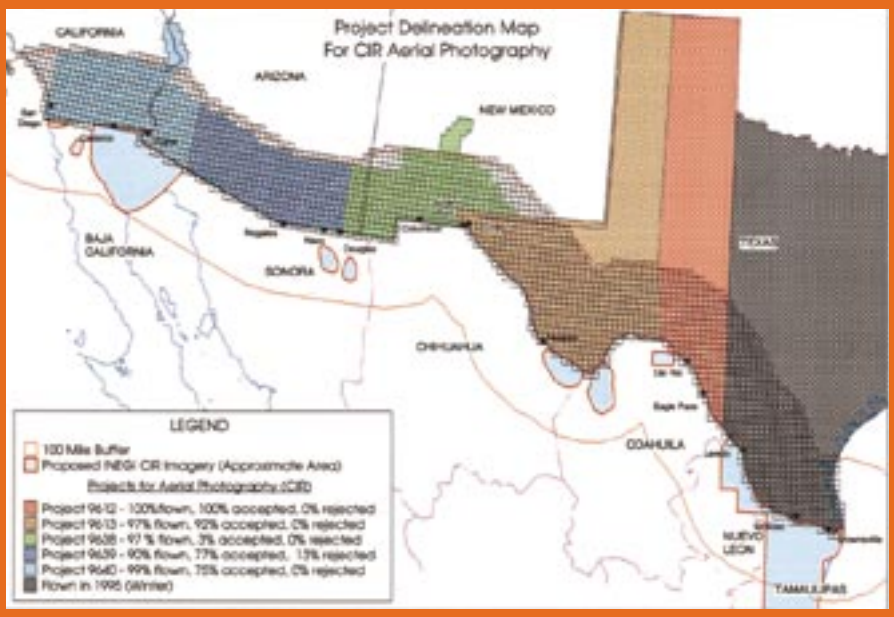
Indicator

S

STATE INDICATORS

Amount of updated Geographic Information System data.

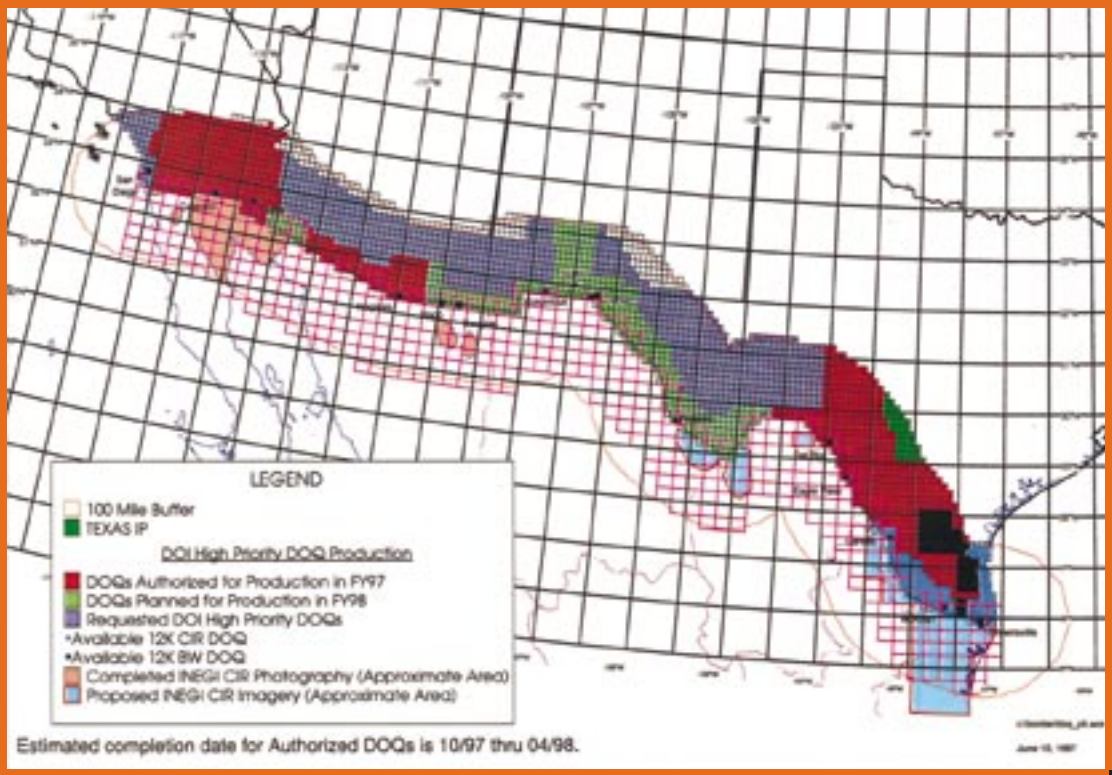
Color Infrared (CIR)



This binational initiative to acquire aerial photography will be used as the foundation for subsequent binational digital mapping efforts and for populating geographic information systems. Data were collected for the Color Infrared Aerial Photography project in 1995 and 1996 for nearly all of the U.S. border area. CIR was acquired because it can derive black and white and color products, and it is the film of choice for natural resources analysis. CIR can be applied in projects ranging from natural resources and biodiversity protection to emergency response.

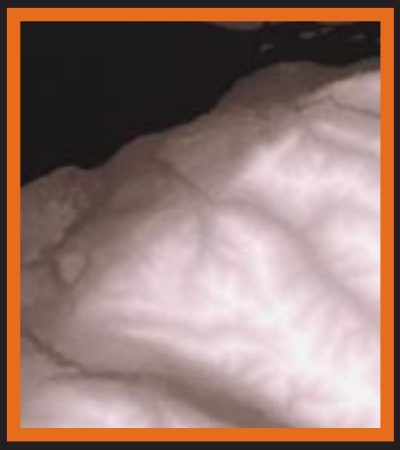
Digital Orthophoto Quadrangle (DOQ)

A digital orthophoto quadrangle is a digital image of an aerial photograph in which displacement caused by the camera angle and the terrain have been removed. DOQs combine the image characteristics of a photograph with the geometric qualities of a map. DOQs are commonly used as a backdrop to update existing digital line graph data or as a source to generate new digital data.



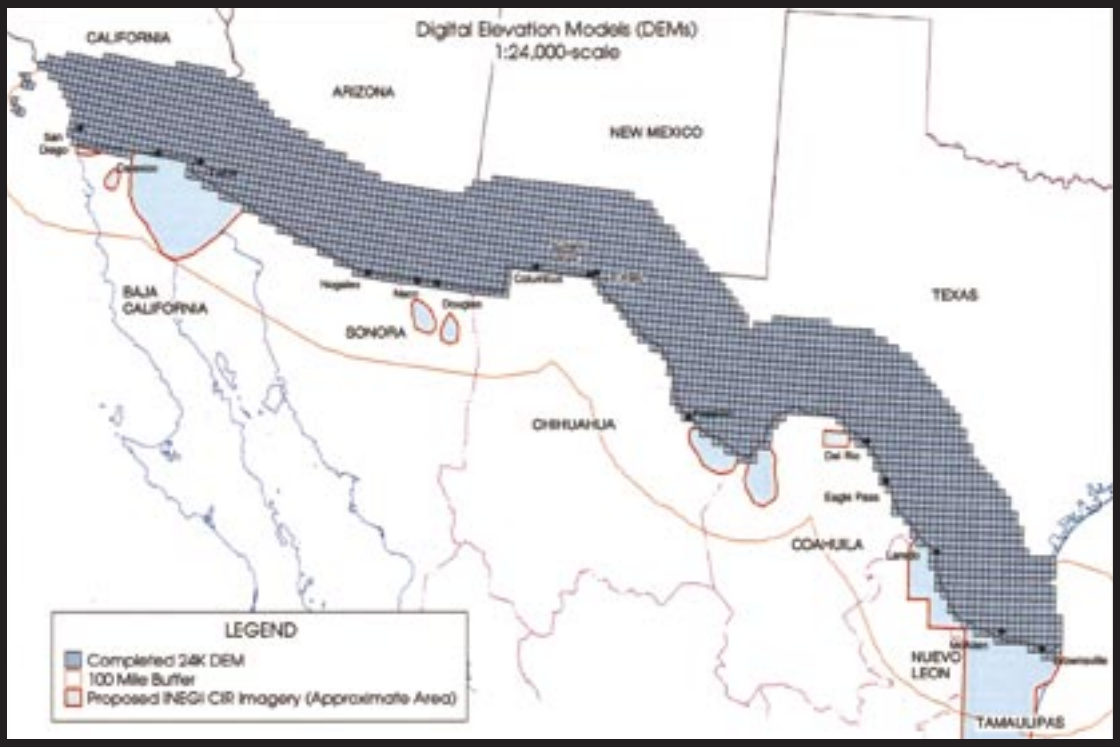
Digital Elevation Models (DEMs)

Digital Elevation Models are digital records of terrain elevations for ground positions at regularly spaced intervals. DEMs are used as a single information layer or merged and used as reference backdrops for various types of data.



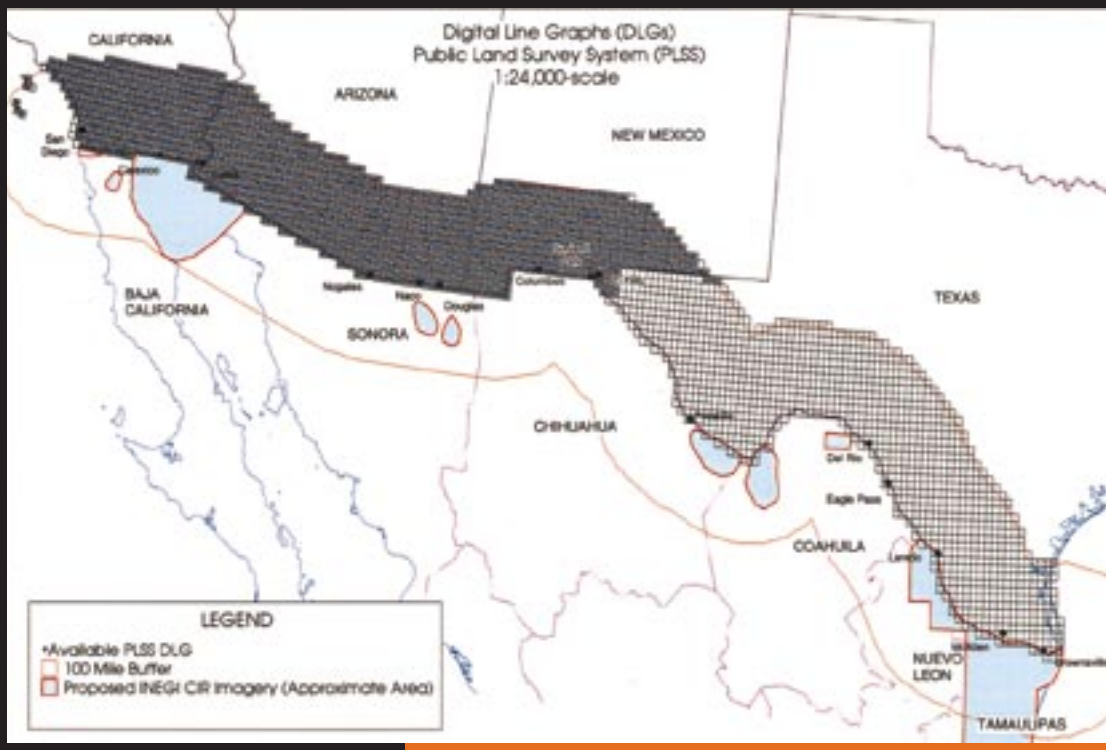
Greyscale

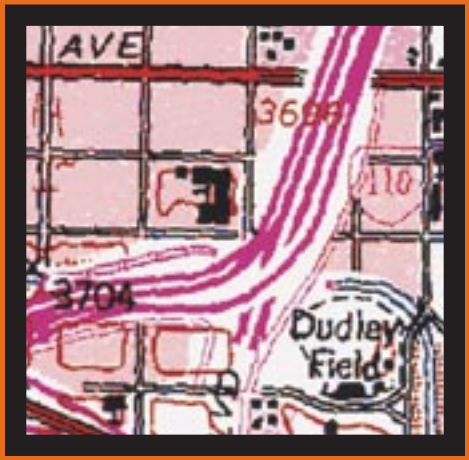
Shaded Relief



Digital Line Graphs (DLGs)

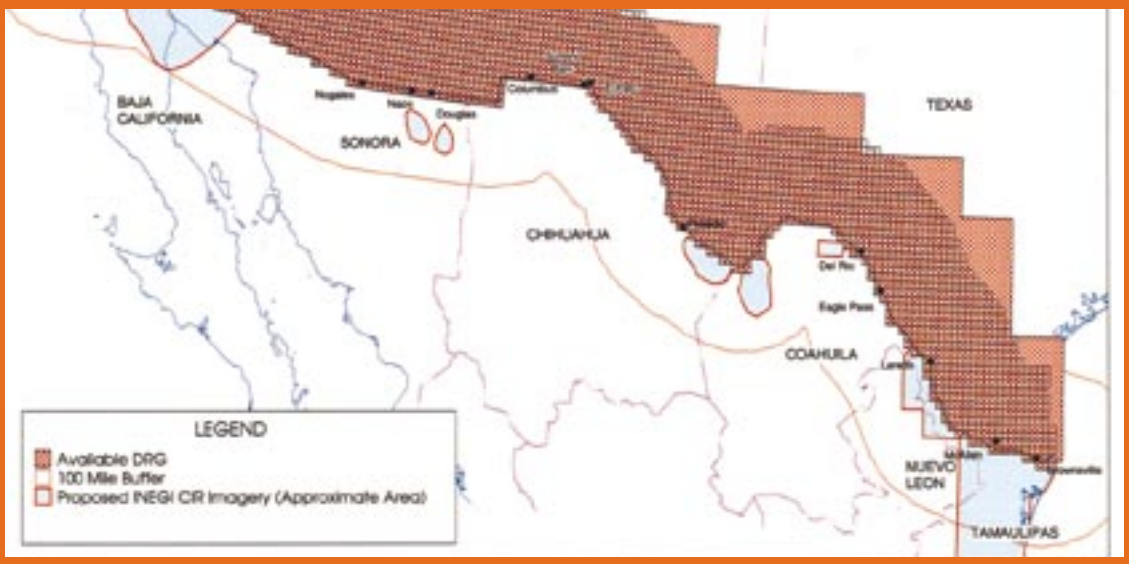
Digital Line Graphs are spatial representations by points, lines, and areas of planimetric information. DLGs can be used separately or combined for integrated analysis. The USGS currently produces 11 DLG overlays. For the border area, two DLG layers have been completed: boundaries and the Public Land Survey System. Transportation, hydrography, and hypsography layers are in production.





Digital Raster Graphics (DRG)

A Digital Raster Graphic is a scanned image of a USGS topographic map. DRGs can be used to collect and revise other digital data. The scanned image includes all map collar information. The image inside the map neatline is geo-referenced to the surface of the earth.



Hazardous and Solid Waste

On the border, rapid industrialization and the associated increase in population have created a need for improved hazardous and solid waste management infrastructure. Hazardous and solid waste, managed improperly, can pose dangers to human health ranging from headaches to cancer, and can cause significant harm to the environment. Specific waste-related issues that need to be addressed include illegal transboundary shipments of hazardous waste; improper disposal of hazardous and solid waste; health and environmental risks posed by inactive and abandoned sites; the need for proper development of new sites; and the proper operation and closure of existing sites.

The Hazardous and Solid Waste Workgroup undertakes activities that promote sound waste management practices and pollution prevention. Primary goals of the Workgroup include building improved capability along both sides of the border to develop and implement waste management programs and improving the monitoring of transborder movements of hazardous wastes and toxic substances.

Although data are available for many of the indicators presented here, the Hazardous and Solid Waste Workgroup was unable to reconcile significant differences among various data sources in time for this year's report. The differences include measurement definition, data collection format, and methods of calculation.

The Hazardous and Solid Waste Workgroup will work over the coming year to reconcile the many differences among data sources in order to provide more complete data on these indicators in the future. In the interim, this report provides information related to the indicators.

Indicator in progress

P

PRESSURE INDICATORS

Total and unit generation of hazardous waste in the border region.

This indicator will show trends in waste generation and allow the Hazardous and Solid Waste Workgroup to assess progress in pollution prevention and target regulatory compliance

Tires illegally disposed of on the Mexican side of the border near Jacumba, California, prior to their removal by EPA and Mexico's Federal Attorney General for Environmental Protection (PROFEPA—Procuraduría Federal de Protección al Ambiente).

efforts. Over the course of the coming year, this indicator will be further refined, and detailed data sources will be identified for tracking this information. One significant challenge in refining this indicator will be determining how best to measure unit generation, such as amount of waste generated per employee or per production unit. EPA and Mexico's National Institute for Ecology (INE—Instituto Nacional de Ecología) will continue to discuss this issue as data become available.

There are some data sources currently available for this indicator, but they do not give a complete picture of waste generation. In 1997, INE began implementing a number of new systems for tracking hazardous waste, which should serve as useful data sources for this and other hazardous and solid waste indicators. One of these new systems is a new manifest system for maquiladora waste, which will provide more accurate data and provide for a clear distinction between maquiladora waste and non-maquiladora waste.

Indicator in progress

P

PRESSURE INDICATORS

Hazardous waste generation in maquiladoras in the border region of Mexico.

This indicator will show waste generation trends in the maquiladora industry. In addition to INE's implementation of a new system for tracking maquiladora waste generation, which will provide critical data for this indicator, the Hazardous and Solid Waste Workgroup is developing a waste generation model targeted specifically at the maquiladora sector. Results from this model will be matched with INE's new data and allow the workgroup to predict future waste generation trends and identify priority areas for waste reduction and compliance efforts. For this year's report, information on the number of maquiladoras in the border area is provided to indicate the size of this sector.

Indicator in progress

R

RESPONSE INDICATORS

Quantities of hazardous waste sent to the United States from Mexico for treatment and/or disposal.

This indicator will provide important data for analyzing trends in waste treatment in the border region. In addition, this indicator will be analyzed in terms of maquiladora and non-maquiladora waste. By comparing overall generation with return rates for hazardous waste, the workgroup will be able to examine levels of compliance with the Mexican requirement that maquiladora waste be returned to the country of origin of the raw materials. This data will come primarily from Haztraks, the binational hazardous waste tracking system, which will provide better cross-border data as INE implements its new manifesting system.

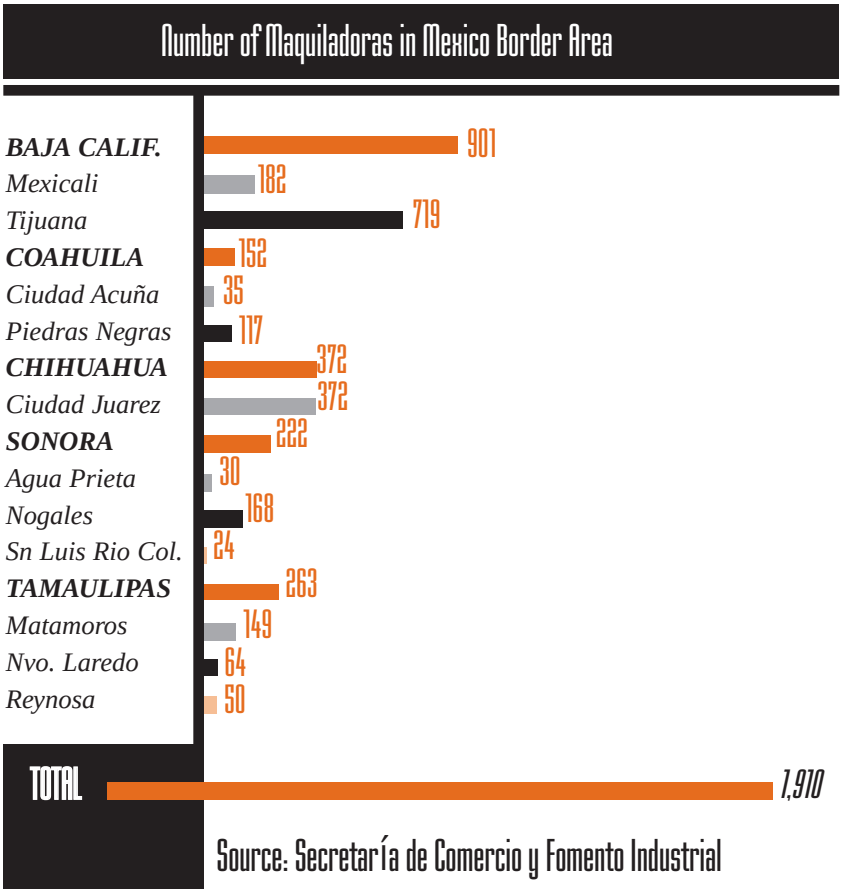
Indicator in progress

R

RESPONSE INDICATORS

Quantities of hazardous waste exported to Mexico for recycling.

This indicator will report on the quantities of hazardous waste being shipped into Mexico under Mexico's "recycling exemption," which states that only



wastes that are intended for recycling may be imported into Mexico. This indicator will provide important data on how much the recycling exemption is utilized. INE will be providing data based on import permit information.

Indicator in progress

R

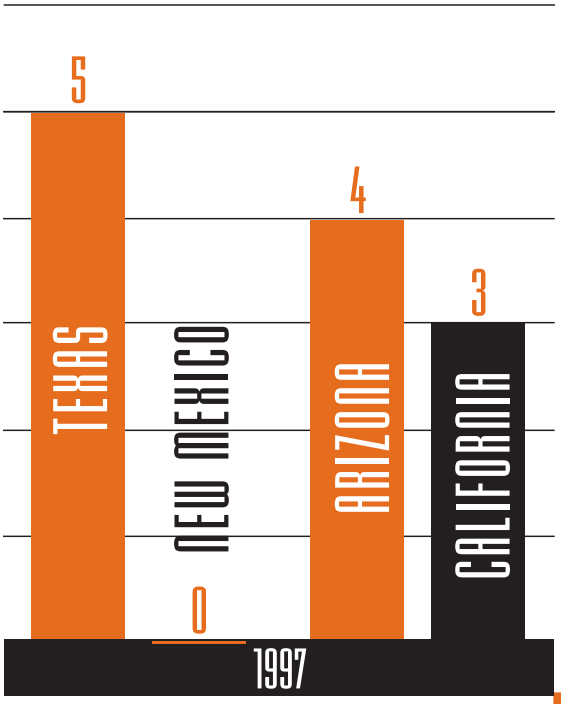
RESPONSE INDICATORS

Permitted commercial disposal capacity for hazardous waste in the border region.

This indicator will measure capacity for handling wastes generated in the border region in order to determine future needs for hazardous waste management infrastructure. The indicator will need to be more precisely defined in order to ensure that it is measured in a way that is compatible with the U.S. and Mexican systems. In addition, the issue of the most useful measure of capacity—lifetime available capacity, annual disposal, or some other measure—will need to be investigated.

Although data are currently available for facilities in the United States, data are captured in many different formats and units of measure, and will have to be adapted to give a comprehensive picture of waste disposal capacity. Over the course of the coming year, the Hazardous and Solid Waste Workgroup will refine this indicator and put the data into a more compatible format. The chart adjacent shows the number of permitted commercial disposal facilities in the border area of the United States. There are currently no permitted commercial hazardous waste disposal facilities in the border region in Mexico.

Commercial Treatment, Storage, and Disposal Facilities in the U.S. Border Region



Source: EPA ARIS database, States
Includes active facilities and those in the permit process

Indicator in progress

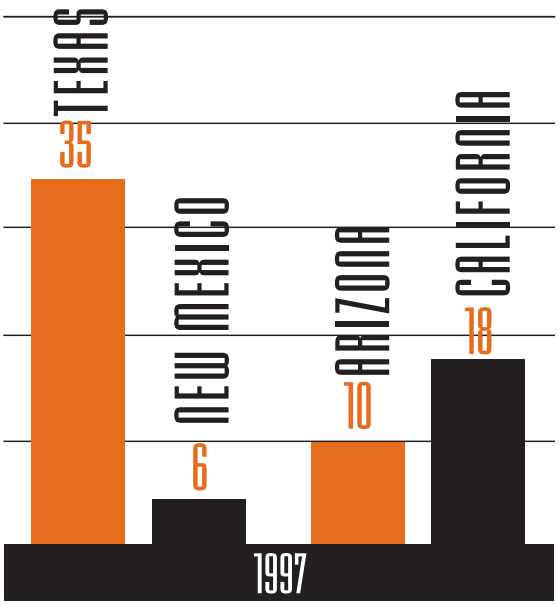
R

RESPONSE INDICATORS

Permitted disposal capacity for solid waste in the border region.

This indicator will measure local capacity for disposing of solid waste generated in the border region. At this time, data for this indicator are incomplete, and the measurement of capacity needs to be defined. In 1998, the Hazardous and Solid Waste Workgroup will work with the U.S. and Mexican border states to determine how to best define capacity and to compile the necessary data. The figures included here give general information on existing solid waste disposal infrastructure in the border region in both countries.

Active Solid Waste Landfills in the U.S. Border Region



Source: EPA ARIS database, States
Includes active facilities and those in the permit process

Indicator in progress

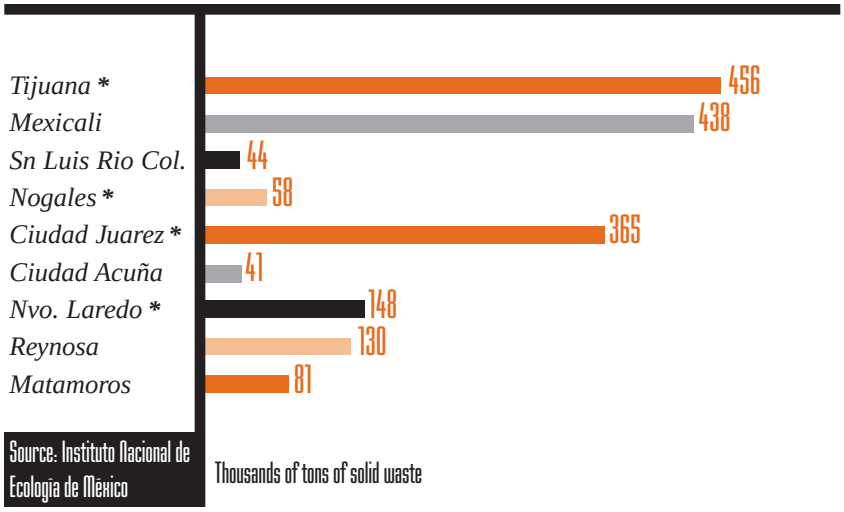
R

RESPONSE INDICATORS

Recycling capacity in the border region.

This indicator will measure the capacity for recycling wastes in the border region. This information is important in targeting pro-active waste management efforts in the region. As with the other indicators dealing with capacity, further definition of this indicator is required. In refining this indicator, the workgroup will address how best to define capacity and what types of waste are most useful and appropriate to include in this measure.

Volume of Waste Received at Solid Waste Disposal Sites in Mexico 1996



Source: Instituto Nacional de Ecología de México

*Cities with a sanitary landfill.

The 1996 Border XXI Implementation Plan describes twenty-five Natural Resources Workgroup projects and activities in the U.S. and Mexico that will have high priority over the next two to three years. The objectives of most of these initiatives are to establish communications and data exchange among colleagues and partners on both sides of the border in all geographic regions.

Success will be measured in terms of the common understanding of the issues and the science, and achieved through training and exchange programs, various formal and informal agreements, and by starting to fill identified data gaps. Consequently, many of the initial Natural Resources Workgroup indicators are performance indicators. Some of the indicators emphasize two pilot areas: the Big Bend–Maderas del Carmen–Santa Elena Canyon areas, and the Western Sonoran Desert–Colorado Delta areas.

Baseline data, as well as additional indicators, are being developed by the workgroup and will be used in future reports. Some of the indicators being developed are summarized below.

Indicators of Binational Cooperation in Resource Inventories and Management

Indicators in progress

R RESPONSE INDICATORS

Number of binational resource management inventories and assessments for soils, vegetation and wildlife.

R RESPONSE INDICATORS

Percentage of full coverage of soil surveys, inventories of soil uses and vegetation, and watershed boundary mapping in cross-border projects.

R RESPONSE INDICATORS

Number of courses and workshops in natural resource management, law enforcement for protection of sensitive species, and other environmental education; number of participants.

R RESPONSE INDICATORS

Number of coordinated, binational responses to forest fires and other wildland fires with the potential to cross the international border or to threaten sensitive species habitat.

Indicators of Habitat and Species Protection and Restoration

Indicators in progress

R RESPONSE INDICATORS

Number of sites and quantity of habitat in projects, designations and agreements that have increased protection, restoration, or improvement of native vegetation and wildlife species in wetlands, riparian and aquatic areas, forest lands, and desert uplands and grasslands.

R RESPONSE INDICATORS

Number of projects implemented from recovery plans, agreements, and other recovery efforts for sensitive flora and fauna species.

R RESPONSE INDICATORS

Number of instances of interdictions of vegetation or wildlife illicitly transported across the international border per number of inspections (regulated species).

INDICATORS TO BE CONSIDERED FOR FUTURE DEVELOPMENT

Indicators of Species Health and Protection

These indicators will consider existing databases of health, the condition of specific wildlife and plant populations, and the control of cross-border spread of vegetation and wildlife diseases.

Indicators of Economically Sustainable Natural Resource Management

These will be indicators of long-term economic benefits in the management of renewable natural resources, eco-tourism, recreation, and other management activities.

Boquillos Canyon, Big Bend National Park, Texas.

Pollution Prevention

Adjacent to the TRW maquiladora in Chihuahua, workers construct a daycare facility for the children of TRW employees using entirely recycled materials.

Investing resources to reduce or prevent pollution is often a much more cost effective means of improving the environment and avoiding environmental health problems than spending resources on regulation, treatment, storage, and disposal. Many of the objectives of the Pollution Prevention Workgroup thus entail increasing technical exchange at all levels of government to enhance assistance and outreach to industry, federal, state, and municipal authorities, and the public. As a means of measuring the progress of the Pollution Prevention Workgroup's initiatives in accomplishing its pollution goals, the following indicators have been developed. Several of these indicators will rely on data that are normalized for production, a calculation that distinguishes actual reductions in waste generation from normal changes in production.

Indicators in progress

P PRESSURE INDICATORS

Amount of waste generated in the border area in specific sectors or industries after implementing pollution prevention methods, normalized for production.

P PRESSURE INDICATORS

Amount of waste generated in the border area, normalized for production.

The first indicator in this pair of indicators will measure specific waste generation amounts for certain sectors or industries after pollution prevention methods have been implemented through training workshops, site assistance visits, and capacity-building projects. The second indicator will measure the total amount of waste generated in the border area.

In 1998, the Pollution Prevention Workgroup will begin measuring waste generation amounts for certain sectors that have implemented pollution prevention methods. Data obtained through Haztraks, a binational hazardous waste tracking system, will be used as a baseline to compare the growth of industrial sectors to the amount of waste returning to the United States from Mexico for disposal. Data from U.S. Toxic Release Inventory and the Mexico's Pollutant Release and Transfer Register (Registro de Emisiones y Transferencia de Contaminantes), once the latter database is available in 1998 or 1999, will also be used for this indicator.

Indicator in progress

P PRESSURE INDICATORS

Amount of water consumed in industrial processes, normalized for production.

The Pollution Prevention Workgroup's goal is to optimize the consumption of water used in industrial processes to reduce hazardous waste and the use of toxic products. Water conservation and prevention of pollution to water will ensure a clean and plentiful supply of water for future generations of the U.S.-Mexico border communities.

In 1998, the Pollution Prevention Workgroup will begin collecting data from site assistance visits, workshops, and industry to measure project-specific water consumption amounts before and after the implementation of water conservation and pollution prevention methods.

Indicator in progress

P PRESSURE INDICATORS

Amount of energy consumed, normalized for production.

Optimizing the consumption of energy in the industrial process conserves energy for use by future generations.

In 1998, using project-specific data collected from site assistance visits, workshops, and industry, the Pollution Prevention Workgroup will begin tracking energy consumption before and after pollution prevention principles have been applied.

Indicator in progress

P

PRESSURE INDICATORS

Amount of volatile organic compounds, nitrogen oxides, and particulate matter emissions in the El Paso-Sunland Park-Ciudad Juarez area.

This indicator will be based on data collected from air monitoring stations already in place to measure changes in air quality. Although changes may be attributable to causes other than pollution prevention efforts, the Pollution Prevention Workgroup will be able to use the information as a tool to identify possible sources for pollution prevention assistance.

Indicator in progress

R

RESPONSE INDICATORS

Amount of participation from industry, all levels of government, universities, and communities in workshops promoting pollution prevention techniques and recycling programs.

This indicator will measure how many representatives from industry, government, universities, and communities have received training in pollution prevention initiatives and methods. This data will be collected beginning in 1998.

This indicator will measure the effectiveness of the workshops and capacity-building activities of the Pollution Prevention Workgroup. Such capacity-building activities have an indirect effect on the environment as a result of the implementation of pollution prevention plans, which minimize waste. The Pollution Prevention Workgroup has some data from follow-up site assistance visits, and will begin collecting data from participants at workshops and training sessions. This indicator may be expanded to include other data, such as the cost savings as a result of implementing pollution prevention methods. Data may be available for this indicator beginning in 1998.

Indicator in progress

R

RESPONSE INDICATORS

Number of pollution prevention practices that have been implemented after a site assessment visit, workshop, or training session.

Indicator in progress

R

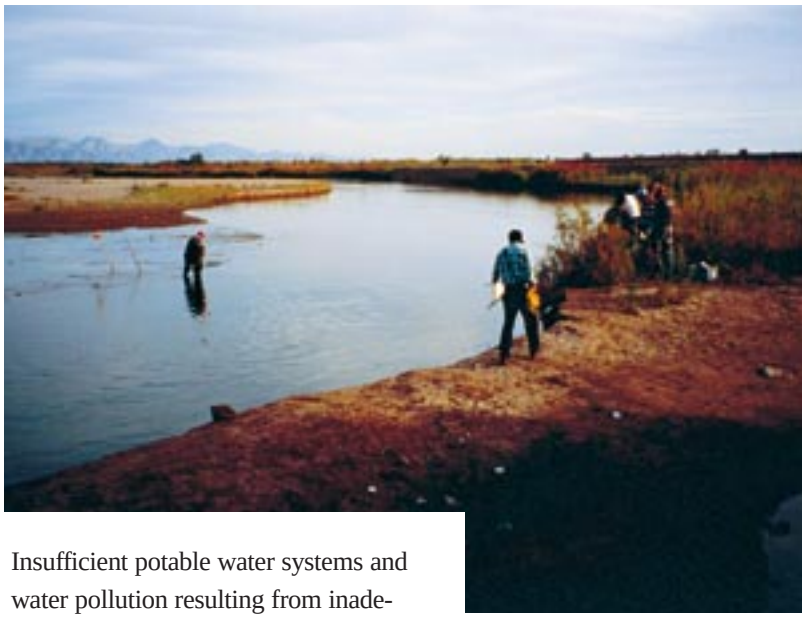
RESPONSE INDICATORS

Amount of non-toxic chemicals or materials substituted for toxic chemicals or materials.

The substitution of non-toxic chemicals for toxic chemicals in the industrial process will result in the reduction of hazardous waste. Beginning in 1998, project-specific hazardous waste reduction data will be collected. In 1998 or 1999, the Pollution Prevention Workgroup will use data that are collected regularly on the release and transfer of chemicals, using the U.S. Toxics Release Inventory and the Mexico's Pollutant Release and Transfer Register (Registro de Emisiones y Transferencia de Contaminantes).

These wheelchairs were made from recycled materials at a TRW plant in Chihuahua by disabled individuals assisted by a TRW engineer, at a cost 1/15 of the market price.

Water

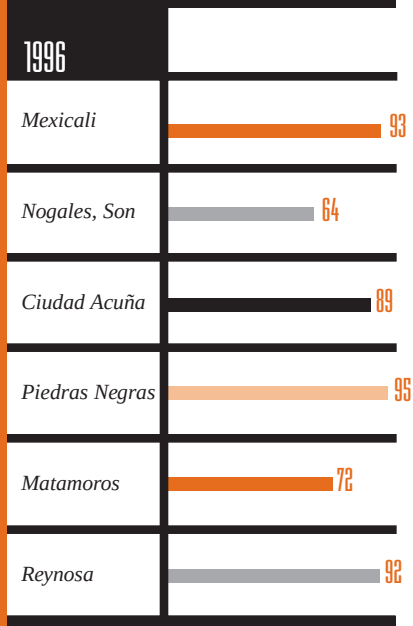


Water quality sampling on the Colorado River.

Insufficient potable water systems and water pollution resulting from inadequate wastewater infrastructure are some of the principal environmental and public health problems facing the border area. In addition, both the growing human population and the abundant and diverse wildlife found in the border region are dependent on a limited supply of water. As a result, the development of an understanding of the quality and quantity of water resources in the border region is critical.

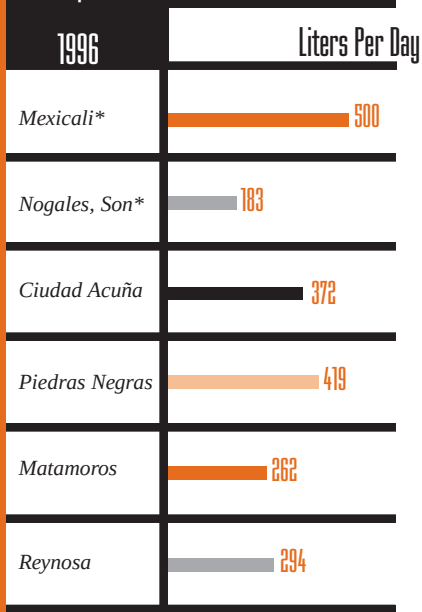
The Water Workgroup acts on binational priorities for environmental infrastructure development, pollution prevention and watershed planning, water quality monitoring, environmental training, and public education and involvement. The indicators listed below measure progress towards alleviating water pollution problems through the development of needed wastewater and potable water infrastructure, and progress towards improving surface and sub-surface water quality. In addition, they provide information on the sustainability of the water resources in the border region. The indicators selected were also based on the availability of data.

Percentage of Population Served Potable Water in Mexico



Sources: Comisión Nacional de Agua, Comisión Municipal de Agua Potable y Alcantarillado de la Ciudad de Reynosa, Junta de Aguas y Drenaje de la Ciudad de Matamoros, Sistema Municipal de Agua Potable y Saneamiento de Piedras Negras, Sistema Municipal de Agua Potable y Saneamiento de Ciudad Acuña, Comisión Estatal de Servicios Públicos de Mexicali.

Amount of Potable Water Available Per Capita in Mexico



* 1995

Sources: Comisión Nacional de Agua, Comisión Municipal de Agua Potable y Alcantarillado de la Ciudad de Reynosa, Junta de Aguas y Drenaje de la Ciudad de Matamoros, Sistema Municipal de Agua Potable y Saneamiento de Piedras Negras, Sistema Municipal de Agua Potable y Saneamiento de Ciudad Acuña.Saneamiento de Ciudad Acuña, Comisión Estatal de Servicios Públicos de Mexicali.

ENVIRONMENTAL INFRASTRUCTURE PROJECT DEVELOPMENT

Indicator

S

STATE INDICATORS

Percentage of population being served potable water.

Having a safe, reliable source of drinking water is critical to ensuring adequate public health, because many disease-causing organisms live in contaminated water. Planning and construction of drinking water infrastructure in the border area, to enable the safe, reliable delivery of drinking water, is an important activity associated with the Water Workgroup. This indicator identifies the percentage of a city's population that is served drinking water from a central system, and is

intended to help assess the effectiveness of current and planned infrastructure projects.

In the U.S., essentially the entire population of the major border cities has drinking water service all of the time. This is not true for all smaller border communities, but data for such communities were not readily available for this report. Data will be reported for select U.S. communities in future reports.

In Mexico, some border cities do not have complete drinking water distribution systems. In addition, sufficient drinking water may not be available at all times, even though a drinking water distribution system is in place. For select border cities, data are presented on the population served and the amount of water available per person. While it is important for people to have access to a sufficient amount of drinking water, the Water Workgroup also recognizes that water conservation is an important objective in some border communities.

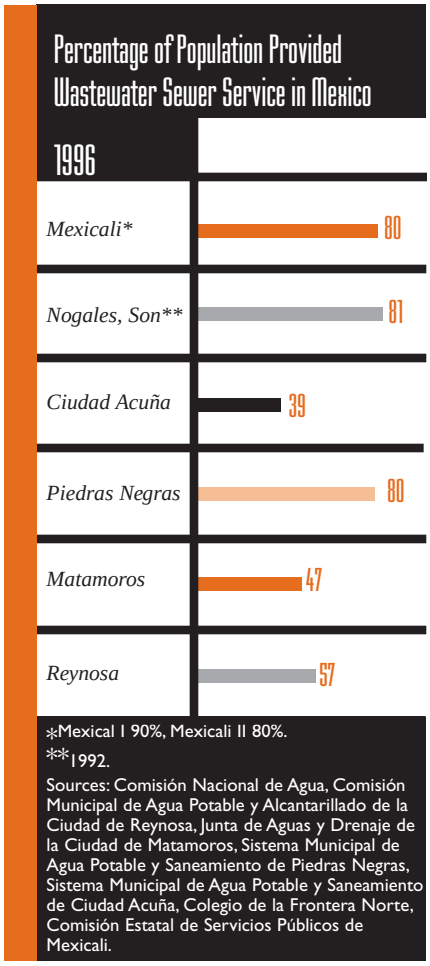
Indicator

R

RESPONSE INDICATORS

Percentage of population provided wastewater sewer service.

Wastewater contains chemicals and disease-causing organisms that can threaten public health. Sewers are needed to collect wastewater and minimize public exposure to untreated wastewater. The Water Workgroup is involved with the planning and construction of wastewater sewer infrastructure in the border area. This indicator measures the percentage of a community's population that has sewer service, and is intended to help assess the effectiveness of current and planned infrastructure projects.



*Mexical I 90%, Mexicali II 80%.
**1992.
Sources: Comisión Nacional de Agua, Comisión Municipal de Agua Potable y Alcantarillado de la Ciudad de Reynosa, Junta de Aguas y Drenaje de la Ciudad de Matamoros, Sistema Municipal de Agua Potable y Saneamiento de Piedras Negras, Sistema Municipal de Agua Potable y Saneamiento de Ciudad Acuña, Colegio de la Frontera Norte, Comisión Estatal de Servicios Públicos de Mexicali.

In the United States, essentially the entire population of the major border cities has sewer service. This is not true for all smaller border communities, but data for these communities were not readily available for this report. Data will be reported for select U.S. communities in future reports.

In Mexico, not all border cities have complete sewer service. Data are provided for select border cities.

Indicator

R

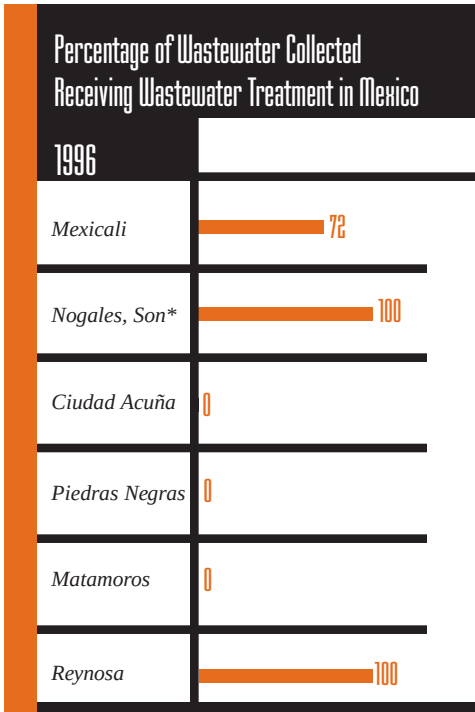
RESPONSE INDICATORS

Percentage of wastewater collected receiving wastewater treatment.

Treatment of wastewater is necessary to remove pollutants and disease-causing organisms. Exposure to untreated wastewater can jeopardize public health. The Water Workgroup is involved in the planning and construction of wastewater treatment infrastructure in the border area. This indicator is intended to help assess the effectiveness of current and planned infrastructure projects.

In the United States, during dry weather, essentially all wastewater is treated in major border cities. This is not true for all smaller border communities, but data for such communities were not readily available for this report. Data will be reported for select U.S. communities in future updates.

In Mexico, not all border cities provide treatment to all wastewater generated. Data are provided for select border cities.



* 1997
Sources: Comisión Nacional de Agua, Comisión Municipal de Agua Potable y Alcantarillado de la Ciudad de Reynosa, Junta de Aguas y Drenaje de la Ciudad de Matamoros, Sistema Municipal de Agua Potable y Saneamiento de Piedras Negras, Sistema Municipal de Agua Potable y Saneamiento de Ciudad Acuña, Comisión de Agua Potable y Alcantarillado del Estado de Sonora–Unidad Nogales, Comisión Estatal de Servicios Públicos de Mexicali.

Indicator

R

RESPONSE INDICATORS

Percentage of total volume of drinking water being disinfected prior to delivery.

Drinking water can be contaminated with disease-causing organisms. In order to safeguard against such organisms, communities can disinfect drinking water prior to distribution to households.

In the United States, major border cities disinfect their drinking water prior to distribution to households, but exact data were not available for this year's report. Data will be reported for select U.S. communities in future reports. For Mexico, data are reported for select border cities.

Water quality sampling on the New River.

SURFACE AND SUB-SURFACE WATER QUALITY

Indicator in progress

S STATE INDICATORS

Water quality of transboundary surface waters.

The adjacent box lists the surface water watersheds that the Water Workgroup has selected to develop surface water quality indicators for.

Data will cover the period of 1987 to the present, and will include latitude, longitude, chloride, specific conductance, hardness, phosphate, oil and grease, nitrate, ammonia, turbidity, fecal coliform, dissolved oxygen, total dissolved solids, and methylene blue active substances (detergents). Data have been collected from various Federal and state agencies for these sites, and are being converted into a form that can be plotted.

Indicator in progress

S STATE INDICATORS

Water quality of transboundary sub-surface waters.

The Water Workgroup is developing sub-surface ground water quality indicators for the sub-surface ground water basins listed in the adjacent box . Data will cover the period of 1987 to the present, and will include latitude, longitude, chloride, specific conductance, hardness, phosphate, oil and grease, nitrate, ammonia, turbidity, fecal coliform, dissolved oxygen, total dissolved solids, and methylene blue active substances (detergents). Data have been collected from various Federal and state agencies for these basins, and key wells are being selected for inclusion as indicator wells. The data are being converted into a form that can be plotted.

Surface Water Watersheds in the U.S. and Mexico

COLORADO RIVER

San Luis Colorado

Morelos Reservoir

U.S. Geological Survey gauging stations

Welton-Mohawk Canal

NEW RIVER

Mexicali

Calexico

Westmoreland

RIO GRANDE

Matamoros-Brownsville

Reynosa-McAllen

Falcon Reservoir

Nuevo Laredo-Laredo

Piedras Negras-Eagle Pass

Ojinaga-Presidio

Cd. Juárez-El Paso

Elephant Butte Reservoir

SAN PEDRO RIVER

Border zone area

SANTA CRUZ RIVER

Border zone area

SUSTAINABILITY OF WATER RESOURCES

The Water Workgroup will collect stream gaging information for the surface water sites identified in the surface water watershed box. This data will be plotted as a time series for the period of 1987 to the present. Static water level data will be collected from the indicator wells selected for the sub-surface ground water basins listed in the adjacent box, and will be plotted as a time series for the period of 1987 to the present.

Sub-Surface Ground Water Basins in the U.S. and Mexico

EDWARDS AQUIFER AT DEL RIO-CIUDAD ACUÑA

HUECO BOLSON AT EL PASO-CD. JUAREZ

MIMBRES BASIN

SAN PEDRO RIVER GROUND WATER BASINS

IMPERIAL-MEXICALI VALLEYS GROUND WATER BASINS

Conclusion

This report represents the first binational effort to develop environmental indicators for the U.S.-Mexico border region. Despite the limitations described earlier, this report is expected to contribute significantly to the dissemination of environmental information in the border zone by providing the public with information about important environmental issues. The process of identifying and selecting indicators is just beginning. This first generation of indicators is the starting point for developing and consolidating a more complete system in the future.

The environmental indicators in this report are the result of the efforts of the nine Border XXI Workgroups, state, tribal, and local agencies, and border communities. The indicators were selected taking into consideration the complexity and availability of information on environmental problems.

There are several challenges to address as we move forward:

- Generally, the amount of environmental information in the border area is limited. When such information does exist, it is often difficult to collect because many federal, state, and municipal entities are responsible for different aspects of it.
- The information provided by each of the workgroups differs in terms of quantity and complexity. Consequently, we plan to further develop the methodology for gathering data and to increase environmental monitoring.
- The environmental information being collected by various entities sometimes overlaps. On both sides of the border, efforts are being made to collect environmental information by governmental entities as well as academic institutions and non-governmental organizations. In order to make significant progress, it is essential that these entities in the United States and Mexico join forces to provide more compatible data.

For future reports, we intend to integrate the indicators to demonstrate the relationship between pressure, state, and response indicators and better reflect the progress made toward reaching the objectives of Border XXI. We believe this approach will allow for a more thorough evaluation of the effectiveness of the environmental policies in the border region.

As future reports are developed, we plan to strengthen the participation of the border communities, state, tribal, and local agencies, interested organizations and citizens, and the private sector. We look forward to improving future editions of this report, and welcome your comments.

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U.S. Environmental Protection Agency and Florida Center for Public Management. National Air and Radiation Indicators Manual, 1997.

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Appendix

Summary of Environmental Indicators

Air

Areas that have exceedances of ambient air standards.

Number of exceedances of each ambient air standard.

Ambient air concentrations for the criteria pollutants in each sister city.

Emissions of pollutants.

Contingency Planning and Emergency Response

Number and location of industries along the border posing risk that have coordinated emergency response plans.

Number of organizations capable of responding to chemical emergencies along the border, by state and locality or municipality.

Number of sister cities with Local Joint Plans.

Number of accidents of record per year, classified by type, frequency, and hazardous substance.

Cooperative Enforcement and Compliance Assurance

Number of inspections conducted.

Number of enforcement actions and penalties.

Amount of money spent on injunctive relief and Supplemental Environmental Projects in the United States.

Amount of pollution reduced as a result of enforcement.

Environmental Health

Percent reduction in total pesticide exposure and number of children impacted.

Number of maps linking geographic information (e.g., land use) to health events or high risk groups.

Number of people receiving advanced training and the number of projects initiated.

Number of Poison Control Centers in operation and the number of people who have received formal training specifically for the U.S.-Mexico border area.

Prevalence of specific health effects, such as elevated blood lead levels on neural tube defects, and number of exposure sources or risk factors identified for intervention.

Number of organizations linked into and using the Health Alert and Disease Outbreak Information Exchange, and a measurement of the effect of "alert" in early intervention in suddenly emerging health risks.

Environmental Information Resources

Number of hits to the U.S.-Mexico Border Internet Homepage.

Amount of updated Geographic Information Systems data.

Hazardous and Solid Waste

Total and unit generation of hazardous waste in the border region.

Hazardous waste generation in maquiladoras in the border region.

Quantities of hazardous waste sent to the United States from Mexico for treatment and/or disposal.

Quantities of hazardous waste exported to Mexico for recycling.

Permitted commercial disposal capacity for hazardous waste in the border region.

Permitted disposal capacity for solid waste in the border region.

Recycling capacity in the border region.

***Note:** Italics signify indicators in progress.*

Natural Resources

Number of binational resource management inventories and assessments for soils, vegetation and wildlife.

Percentage of full coverage of soil surveys, inventories of soil uses and vegetation, and watershed boundary mapping in cross-border projects.

Number of courses and workshops in natural resource management, law enforcement for protection of sensitive species, and other environmental education; number of participants.

Number of coordinated, binational responses to forest fires and other wildland fires with the potential to cross the international border or to threaten sensitive species habitat.

Number of sites and quantity of habitat in projects, designations and agreements that have increased protection, restoration, or improvement of native vegetation and wildlife species in wetlands, riparian and aquatic areas, forest lands, and desert uplands and grasslands.

Number of projects implemented from recovery plans, agreements, and other recovery efforts for sensitive flora and fauna species.

Number of instances of interdictions of vegetation or wildlife illicitly transported across the international border per number of inspections (regulated species).

Pollution Prevention

Amount of waste generated in specific sectors or industries after implementing pollution prevention methods, normalized for production.

Amount of waste generated in the border area, normalized for production.

Amount of water consumed in industrial processes, normalized for production.

Amount of energy consumed, normalized for production.

Amount of volatile organic compounds, nitrogen oxides, and particulate matter emissions in the El Paso-Sunland Park-Ciudad Juarez area.

Amount of participation from industry, all levels of government, universities, and communities in workshops promoting pollution prevention techniques and recycling programs.

Amount of non-toxic chemicals or materials substituted for toxic chemicals or materials.

Number of pollution prevention practices that have been implemented after a site assessment visit, workshop, or training session.

Water

Percentage of population being served potable water.

Percentage of population provided wastewater sewer service.

Percentage of wastewater collected receiving wastewater treatment.

Percentage of total volume of drinking water being disinfected prior to delivery.

Water quality of transboundary surface waters.

Water quality of transboundary sub-surface waters.

Internet Sites

The following Internet sites contain information that may be of interest:

U.S. GOVERNMENT

U.S.-Mexico Border XXI Program:
http://www.epa.gov/usmexicoborder

U.S.-Mexico Information Center on Air Pollution:
http://www.epa.gov/oar/oaqps/cica

U.S.-Mexico Border Environmental Health Program:
http://www.epa.gov/orsearth

U.S.-Mexico HRSA Border Health:
http://gateway.ncfh.org/border

Department of Health and Human Services: http://www.dhhs.gov:80

Department of Justice:
http://www.us.doj.gov

Environmental Protection Agency:
http://www.epa.gov

Environmental Protection Agency "Surf Your Watershed:"
http://www.epa.gov/surf

Environmental Protection Agency Center for Environmental Statistics and Information: http://www.ciesin.org

National Park Service U.S.-Mexico Affairs Office:
http://www.nmsu.edu/~nps

U.S. Geological Survey:
http://www.usgs.gov

MEXICAN GOVERNMENT

Secretaría de Medio Ambiente, Recursos Naturales y Pesca:
http://www.semarnap.gob.mx

Instituto Nacional de Ecología:
http://www.ine.gob.mx

Procuraduría Federal de Protección al Ambiente: http://www.profepa.gob.mx

Comisión Nacional del Agua:
http://www.cna.gob.mx

Comisión Nacional para el Conocimiento y Uso de la Biodiversidad:
http://www.conabio.gob.mx

Instituto Nacional de Estadística, Geografía e Informática:
http://www.inegi.gob.mx

Secretaría de Salud:
http://cenids.ssa.gob.mx

BILATERAL/TRILATERAL

Border Environment Cooperation Commision:
http://cocef.interjuarez.com

Commission for Environmental Cooperation: http://www.cec.org

International Boundary and Water Commission:
http://www.ibwc.state.gov

North American Development Bank:
http://www.quicklink.com/mexico/nad-bank

OTHER

Border EcoWeb:
http://www.borderecoweb/sdsu.edu

California Environmental Protection Agency: http://www.calepa.ca.gov

Texas Natural Resource Conservation Commission:
http://www.tnrcc.state.tx.us

Southwest Center for Environmental Research and Policy:
http://www.civil.utah.edu.scerp

Borderlands:
http://www.txinfinet.com/mader/eco-travel/border/border.html

University of Texas at El Paso:
http://www.cerm.utep.edu

INFOMEXUS:
http://infomexus@infolnk.net

Colonias:
http://lanic.utexas.edu/la/mexico/colonias

Transboundary Resource Inventory Project:
http://www.glo.state.tx.us/infosys/gis/trip
Udall Center: http://upr2.admin.arizona.edu/udall.center

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