



**COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER**

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Abstract

This report outlines a planning approach taken by a Federal Government partnership that is meant to promote sustainable development in the future, integrating both sides of the United States-Mexican border. The twin-city area of Nogales, Ariz., and Nogales, Sonora, Mexico, known collectively as Ambos (both) Nogales, has a common borderland history of urban growth presumably based on changes in policy and economic incentives. We document changes over time in an attempt to identify *colonia* development and settlement patterns along the border, combining a community-participation approach with a remote-sensing analysis, to create an online mapping service.

Introduction

A cooperative agreement was reached among the U.S. Department of Housing and Urban Development (HUD), the U.S. Geological Survey (USGS), the U.S. Census Bureau, the Mexican Secretariat of Social Development (SEDESOL), and the Mexican National Institute of Statistics, Geography, and Informatics (INEGI) to facilitate the exchange of information in the United States and Mexico in order to manage crossborder planning issues and improve housing and living conditions in the *colonias* along the border (Norman and others, 2004a, b). In the United States, *colonias* are defined by HUD as rural communities and neighborhoods located within 150 mi of the border (fig. 1) that lack adequate infrastructure or housing and, possibly, other basic services; in Mexico, these types of community or neighborhood are referred to as *colonias marginales* (Norman and Austin, 2004; Pavri and others, 2004).

Internet map servers have been developed under this initiative to help communities visualize infrastructure and housing conditions binationally for the purposes of sustainable-development planning (Norman and others, 2004a, b). The goal is to monitor *colonia* development and to provide accessible and affordable technological tools in an online geographic-information-system (GIS) database free of charge. Access to public records through Internet-accessible software was selected as an approach to overcome the problems and expense associated with obtaining GIS software and compiling associated data.

This report discusses the changes in Ambos Nogales that have led to the development of *colonias* and *colonias marginales* and how these changes are now being monitored by using an online GIS database through the Colonias Monitoring Program. The objective is to enhance binational planning and to provide tools that may assist in the acquisition of funds set aside for these borderland communities. The online GIS and satellite-image database can be accessed at any time; a user needs only a computer, Internet access, and a Web browser.

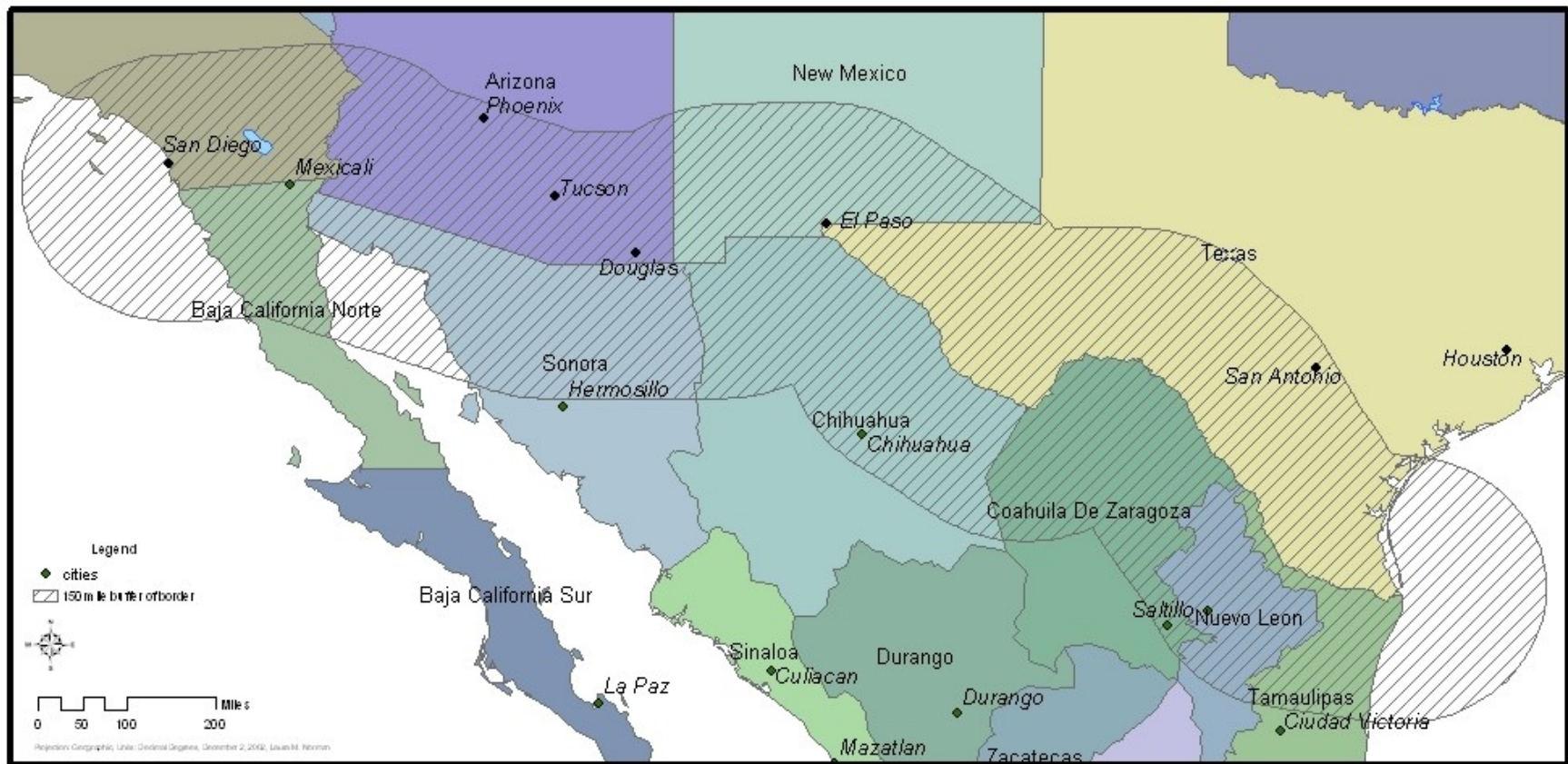


Figure 1: United States-Mexican Border Region, showing locations of major cities (dots) and 150-mi buffer zone (crosshatched area) on either side of the border.

Colonias

In the 1980s, inadequate living conditions and especially high rates of such diseases as cholera and hepatitis A in border communities lacking infrastructure (water and sewage) caused federal government to take action (Pavri and others, 2004). As a result, the La Paz Agreement of 1983 on Cooperation for the Protection and Improvement of the Environment in the Border Area was established, in which the federal governments of both the United States and Mexico defined the border region.

In the 1990s, the U.S. Congress began to require the States bordering Mexico to set aside part of their HUD-allocated Community Development Block Grant (CDBG) funds to begin lessening the poverty and distressed living conditions in the *colonias* (Pavri and others, 2004). Many *colonias* have emerged in rural areas without local governance and the services that government customarily provides. Some *colonias* may be entire border communities, whereas others are neighborhoods within incorporated communities (see “What Are Colonias?”, URL <http://www.hud.gov/groups/frmwrkcoln/whatcol.cfm>).

The number of *colonias* has increased throughout the 1990s and into the 21st century (Pavri and others, 2004). By 2001, more than 1,400 *colonias* were identified in Texas (Ward, 1999), approximately 120 in New Mexico, and 80 in Arizona (Donelson and Holguin, 2001).

Since the early 1990s, Federal and quasi-Federal agencies have provided hundreds of millions of dollars in Federal loans and grants for projects in *colonias*, including HUD’s CDBGs, and Rural Housing and Economic Development Program, and the U.S. Department of Agriculture (USDA)’s Rural Utilities Program and Rural

Housing Service. Such programs as the U.S. Environmental Protection Agency (EPA)'s Border XXI (1996-2001) and Border 2012 (2003-12), as well as the North American Development Bank (NADBank), also provide funds to border communities to address the growing problems associated with *colonias* (Pavri and others, 2004).

Colonias Monitoring Program

The Colonias Monitoring Program began along the Texas border in El Paso/Juarez, in December 2002 and has since expanded to include Eagle Pass/Piedras Negras, Brownsville/Matamoros and the Arizona-Sonora sister cities of Douglas/Agua Prieta (Norman and others, 2004a), Nogales/Nogales, and, most recently, Bisbee and Naco/Naco.

The Colonias Monitoring Program provides the framework for developing a sustainable approach to monitoring *colonia* development along the border. The program was designed to enable more inclusive participation of local entities through the provision of affordable technology made accessible via an Internet-based GIS service and database. The service facilitates access to the information necessary for assessing problems, prioritizing needs, and planning to meet the housing and infrastructure requirements of *colonias* and *colonias marginales* (Pavri and others, 2004) as well as demographic and planning information in relevant geospatial formats that can be used by government entities and nongovernmental organizations in preparing grant and loan applications for community-improvement projects (Lam and others, 2004; Norman and others, 2004a, b). Any areas fitting the legal description of a *colonia* can take advantage of government funding. Therefore, in the implementation of this program in Arizona and Sonora, smaller, *colonia*-like neighborhoods within

incorporated communities of selected borderlands have also been delineated as *colonias*, thereby allowing them to potentially compete for some of those funds.

At this time, the databases for Arizona and Sonora are managed at the Advanced Resource Technology Laboratory in the School of Natural Resources at the University of Arizona (URL <http://crossborder.arizona.edu/colonias/>). Data layers, with information about sewerlines, waterlines, *colonia* boundaries, and changing urban extents, have been compiled for this program.

Land-Use Change in Ambos Nogales

The sister cities of Ambos Nogales are located on the Arizona-Sonoran border (fig. 2) in the Ambos Nogales watershed (Brady, 2001; Brady and others, 2001, 2002).

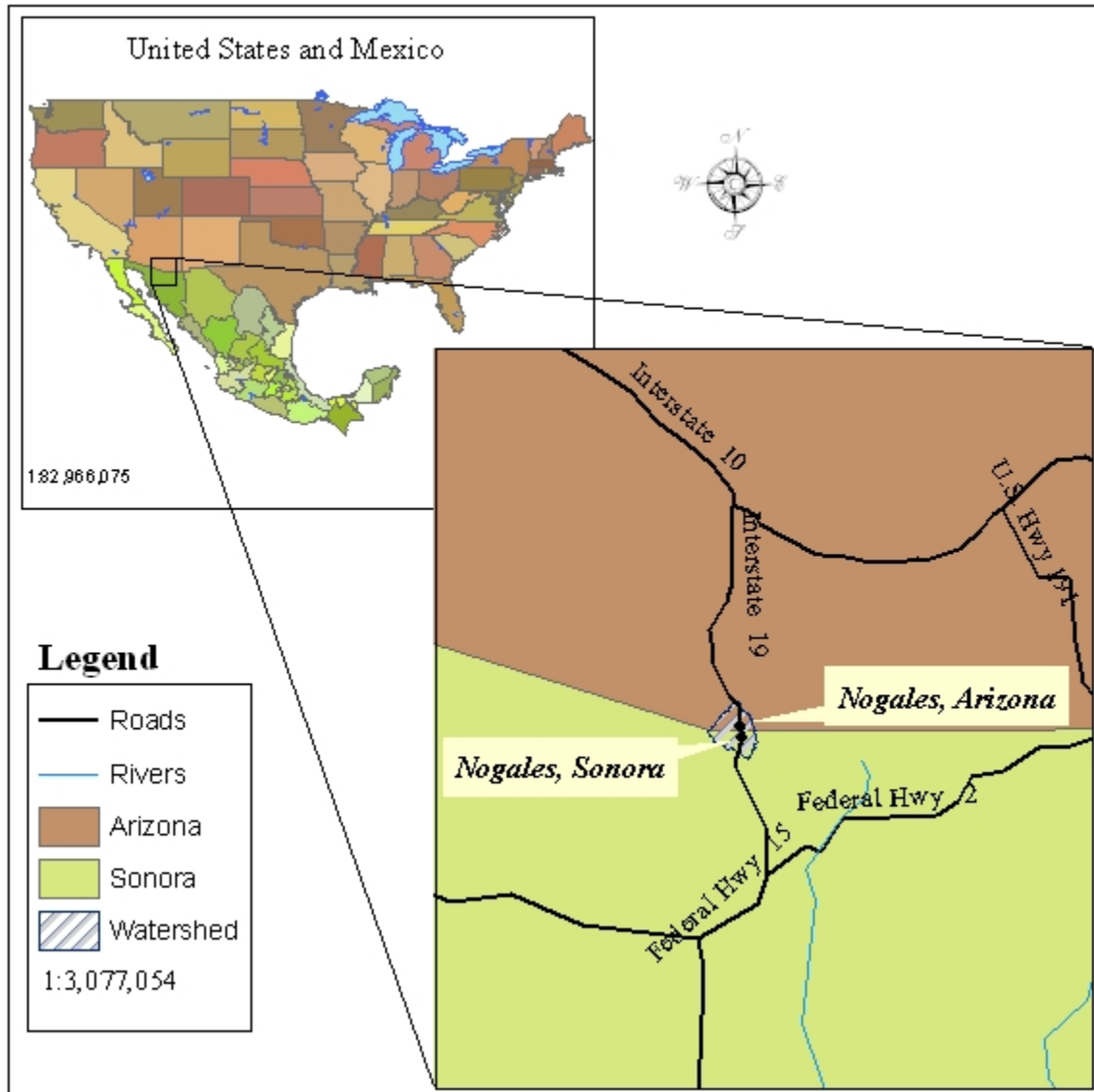


Figure 2: Ambos Nogales along the United States-Mexican border.

Despite its small size in comparison with border sister cities like San Diego/Tijuana and El Paso/Juarez, the twin-city area of Ambos Nogales (fig. 3) has the most commercial traffic, owing to its importance as the primary U.S.-Mexico shipping port for winter vegetables.



Figure 3: Aerial photograph of Nogales, Ariz. (lower left), the United States-Mexican border (diagonally from left to right), and Nogales, Sonora, Mexico (upper right). Photograph by Pamela L. Nagler, 2004.

Historical accounting in Ambos Nogales paints a picture of the twin-city area's ebb and flow in population density over time. The background of policy implementation and financial booms over the past century describes the rapid and sporadic settlement patterns. Urbanization in the semiarid regions of the Southwestern United States is a comparatively recent phenomenon, occurring largely in the past 50 years; this growth has pushed the urban fringe into areas formerly occupied by agricultural land or pristine deserts (Ramsey, 2003). A land-use-change analysis, focused on urbanization in the cities, examines population change and densification of *colonias*. The following section describes how historical factors have contributed to rapid and sporadic settlement patterns. We have performed image processing and

temporal remote-sensing analysis, based around the timeframe 1975-2002 to show how the Ambos Nogales area has grown. Using the same procedures described by Norman and others (2004a), we used Landsat imagery to estimate urban extent change.

Suitability-capability analysis was implemented on the basis of the housing and infrastructure of given areas to support *colonias*. Overlay analysis helped to identify *colonia* development and access to infrastructure.

History of Land Use and Policy Change

The histories of Ambos Nogales are interwoven because of their proximity. The name “Nogales” derives from the Spanish word for “walnut trees,” which used to thrive around the twin cities. The history of the area dates back to the cultures of the Apache, Yaqui, and Hohokam peoples who built their communities along the Santa Cruz River, when water flowed year round and provided for agriculture and ranching sites. Families have been raising livestock in the area of Ambos Nogales since at least the 1500s.

The history of Santa Cruz County records that a Franciscan missionary, Father Marcos de Niza, who was the first European to cross the border, came to the area as early as 1539 in search of Cibola (the Seven Cities of Gold). His report on the district promoted a Spanish expedition led by Francisco Vazquez de Coronado in 1540 to lay claim to the cities. Jesuit priest and Austrian missionary Padre Eusebio Francisco Kino established several missions around Nogales, notably Tumacacori, Guevavi, and Cibuta in the late 1600s (URL <http://www.co.santa-cruz.az.us/history.html>).

By 1853, the Gadsden Purchase established the southern part of Arizona, annexing it to the United States. In 1880, a Russian immigrant, Jacob Isaacson, built a

trading post in his namesake, which later became Nogales, Ariz.; 2 years later, Nogales was the site of the first rail connection between the United States and Mexico (fig. 4).

The city of Nogales, Ariz., which was officially founded in 1882 along this north-south railline to promote trade between the two countries, was incorporated in 1893 (URL http://www.sonoranborderlands.com/nogales_mx.html).

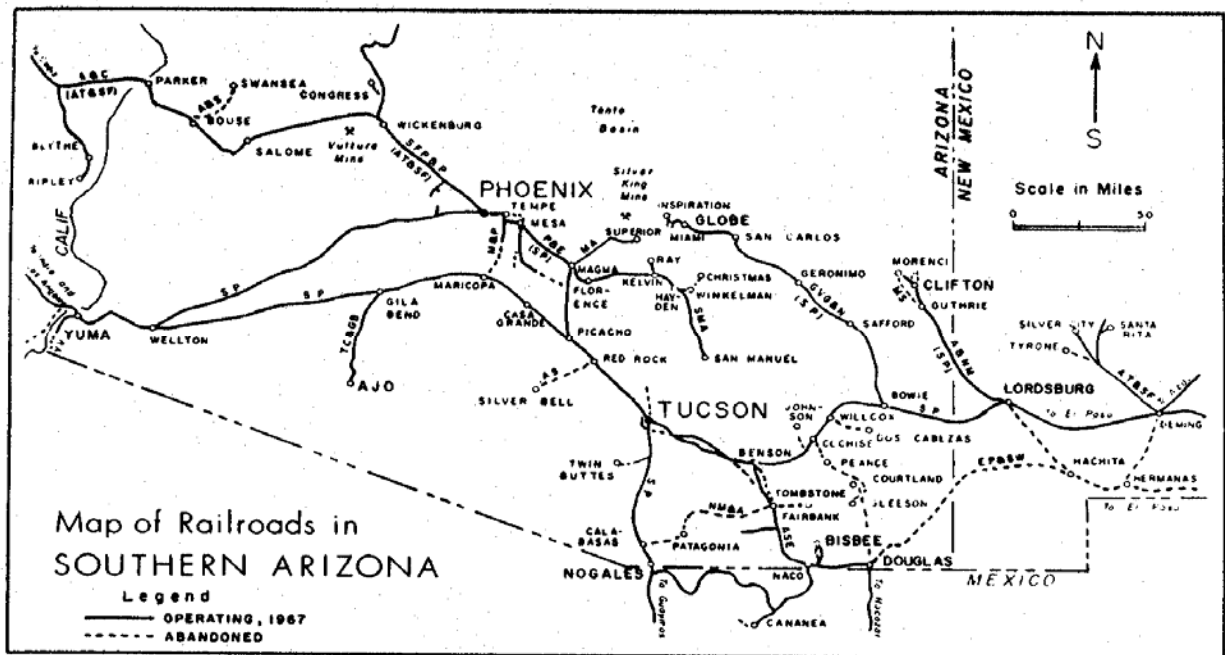


Figure 4: Current and Abandoned Railroads in Southern Arizona (Myrick, 1967).

By 1886, settlers began to expand cattle ranching and irrigation-based farming projects (Goodman, 1969). At that time, the Mexican government created a *zona libre* (free-trade zone) to allow Mexican border communities to import foreign products duty free, in an effort to promote commercial development and reduce outmigration to the United States. However, because of economic rivalry with American merchants and criticism from Mexico City officials that the border region had an unfair advantage, the Porfirio Diaz government abolished the zone in 1905 (Martinez, 1988). The twin cities of Ambos Nogales grew quickly, from a population of 2,700 in 1890, through 4,500 in

1898, to 8,000 by 1909, owing to the railroad stop and commerce that grew up with the establishment of the Mexican free-trade zone (Kearney, 1995).

Farming was a productive enterprise in the region, largely because many workers in both the agriculture and copper-mining industries were affordable, low-wage Mexican employees. The Mexican Revolution of 1910 induced more than a half-million Mexicans to cross the border between 1910 and 1920, with the Arizona-Sonoran border community of Nogales attracting many of them (Norman and others, 2004a). At the time of the 1900 U.S. Census, only 11 percent of Arizona was Mexican, but by 1910, 14.4 percent was Mexican (Meyer, 1987). Skirmishes occurring in Nogales against General Francisco ("Pancho") Villa were reported in 1916, who was rumored to have regularly crossed the border at Nogales to hide out.

During World War I, additional labor demands accelerated more migration, with 1.5 million Mexicans entering the United States during the 1920s (Kearney, 1995). At the same time, however, Sonora's agricultural industry rapidly expanded. Government support of agriculture from 1926 through the 1960s represented a quarter of Mexico's budget, making Sonora the nation's breadbasket (Weaver, 2001).

By the 1940s, agricultural interests prospered, largely owing to the *Bracero* program (which operated from 1942 to 1964). Termination of this program left many Mexican farmworkers unemployed, including an estimated 50 percent in Nogales, Sonora (Baerrensens, 1971). Although agriculture is still important to the border-county economies, it has become slightly less important since the late 1950s and early 1960s (Norman and others, 2004a).

In an effort to offset some of the massive unemployment, the Mexican government launched the *Programa Nacional Fronterizo* (PRONAF, the National Border Program) in 1961 to promote tourism. Soon afterward, the Border Industrialization Program (BIP) in 1965 helped spur large-scale development on the Mexican side of the border through incentives for establishing *maquiladoras*, or foreign owned factories. The ability to send raw materials to Mexico and obtain finished goods duty-free, prompted *maquiladora* operators to set up small-scale U.S. operations on the Arizona side of the border, with larger Mexican assembly operations on the Sonoran side (Norman and others, 2004a).

From 1939 to 1958, Nogales, Arizona's retail sales increased by 677 percent, and its wholesale trade by 2,708 percent, owing to population growth on the Sonoran side of the border and Mexicans' ability to import duty-free products (McCleneghan and Gildersleeve, 1964). BIP was important in stimulating fast population growth in Nogales, Sonora, by the mid-1960s (Kearney, 1995). Nogales' sister city in Arizona has since reaped significant benefit in terms of trade. *Maquilas* are estimated to spend 65-95 percent of their wages in U.S. border towns (Weaver, 2001).

Today, approximately 54 percent of all the people employed in Santa Cruz County, Ariz., and 56 percent of all business establishments in the county are engaged in wholesale and retail trade (U.S. Bureau of the Census, 1997). Santa Cruz County gained considerable manufacturing income through increased *maquiladora* employment (Norman and others, 2004a).

Boosted by the 1986 passage of the Immigration Reform and Control Act, which granted amnesty to undocumented residents as a means of encouraging migrant

families to settle in the United States, and the North American Free Trade Agreement (NAFTA), which went into effect on January 1, 1994, border industrial growth has resulted in massive population growth. The rate of industrial development increased further after the implementation of NAFTA, with about 1,700 *maquiladoras* operating in Mexico in 1990, more than doubling to nearly 3,800 *maquiladoras* in 2001, 2,700 of which were in the Border States (U.S. Environmental Protection Agency, 2000).

In 1990, Nogales, Sonora was the main site of Sonora's *maquila* industry. From 1980 to 1989, Nogales Municipio contained 70% of Sonora's *maquiladoras* and 75% of their workforce. Since then, the *maquildora* industry in Hermosillo (the State capital) has gained momentum as a *maquila* hub, but Nogales Municipio continued to expand in number of *maquildoras* and *maquilas* through the year 2000 (URL <http://monsoon.geog.arizona.edu/~sombbrero/subindexes/Nogales.html#water>).

Although the number of *maquiladoras* operating in Ambos Nogales began to decline in 2000-1 (Table 1), problems associated with a lack of infrastructure remain (Pavri and others, 2004).

Table 1: Number of *Maquiladoras* in Nogales, Sonora, since 1999 (*Twin Plant News*, June issue, 1999-2004; Pavri and others, 2004).

1999	2000	2001	2002	2003	2004
104	109	109	73	79	81

Population estimates vary greatly for Ambos Nogales, but one thing all researchers can agree upon is a rapid increase over the years (fig. 5).

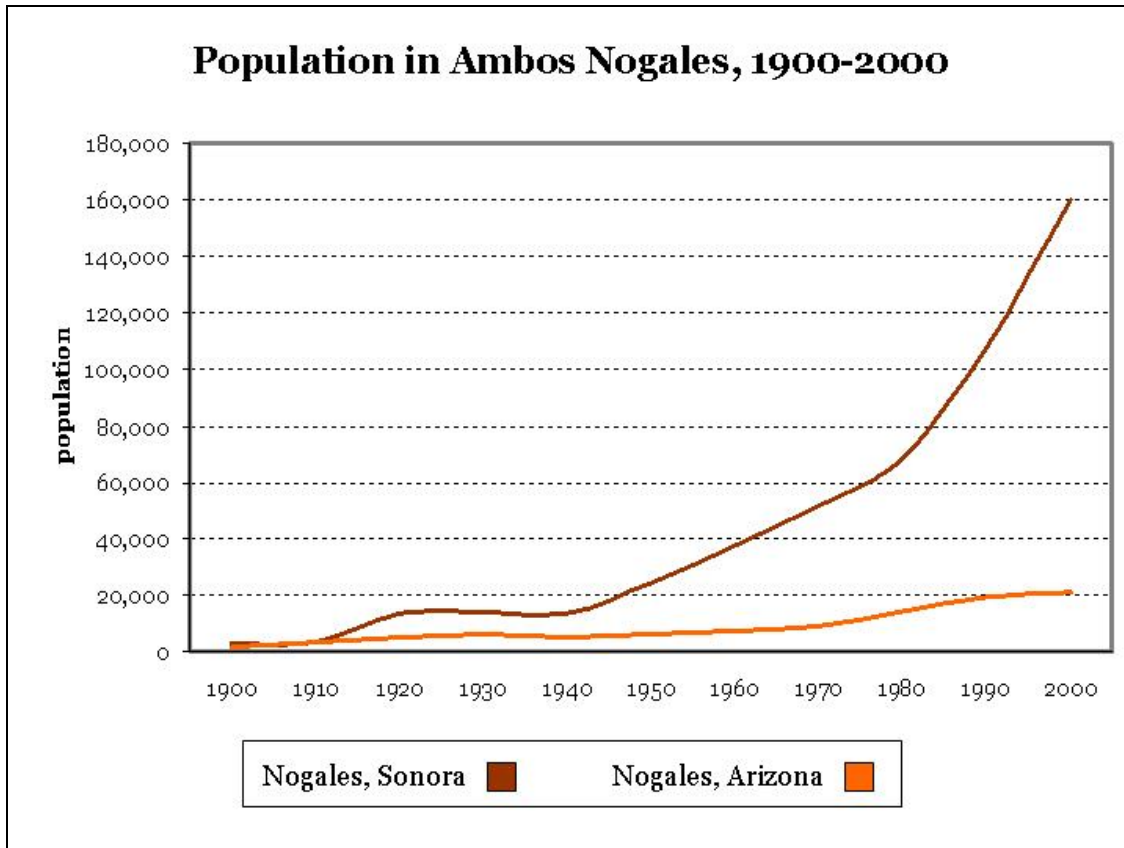


Figure 5: Population growth in Ambos Nogales, 1900-2000. (URL <http://monsoon.geog.arizona.edu/~sombbrero/charts/population.jpg>).

Approximately 90 percent of the population along the border resides in 14 twin cities, and the rest live in small towns or rural communities (Pavri and others, 2004).

Monitoring Land Use Change

Monitoring population growth and land-use change can be a great source of information for physical and social scientists who study patterns of human expansion, local environmental impacts, and the demands this places on populations; a popular method to supplement this research is the use of repeat-coverage remote sensing (Ramsey, 2003). Studies have demonstrated the utility of temporal and historical mapping, geographic analysis, and growth modeling in relation to urbanization (Kirtland and others, 1994; Acevedo and others, 1996, 1999; Bell and others, 1995;

Clark and others, 1996, 1997; Crawford-Tilley and others, 1996; Clarke and Gaydos, 1998; Forney and others, 2001). Work has only recently been undertaken to develop methods of measuring impervious surfaces on a watershed scale (Ji and Jensen, 1999; Bird and others, 2000, 2002; Wang and others, 2000; Ward and others, 2000; Justice and Rubin, 2003; Yang and others, 2003). A need has been identified for a consistent technique to calculate watershed imperviousness from readily available and cost-effective remote-sensing information that achieves an acceptable level of accuracy (Hurd and Civco, 2004). Studies by Jackson and others (1977) estimated that the cost benefits of using a Landsat approach for planning purposes are about 2.5 to 1 and can be as high as 6 to 1 over a field approach.

Using the procedures of Norman and others (2004a), we collected Landsat data for four time periods beginning in 1975 from the University of Arizona's Arizona Regional Image Archive (ARIA) (URL <http://aria.arizona.edu/>) and processed them to estimate the change in urban extent over time (fig. 6). Datasets captured between April and June were downloaded in an effort to simulate similar climatic and vegetative conditions; the acquisition dates for the imagery were June 23, 1975, April 14, 1983, May 11, 1996, and June 21, 2002.

Although the satellite data were all acquired from Landsat systems, different sensors were utilized over the years, possibly resulting in some analytical discrepancy. The Landsat-1 satellite acquired multispectral-scanner (MSS) imagery at 79-m resolution in 1975. Landsat-5 Thematic Mapper (TM) sensor acquired data at 30-m resolution in 1983 and 1996, and the Landsat-7 Enhanced Thematic Mapper Plus (ETM+) sensor acquired data at 30-m resolution in 2002. Despite the discrepancy in

resolutions and other changes in the sensors, we were able to determine the urban extents of the twin cities area. In addition, small pockets of nonurbanized areas may have existed within these boundaries, and small urbanized areas outside, but for estimating growth over time, the extents were approximated.

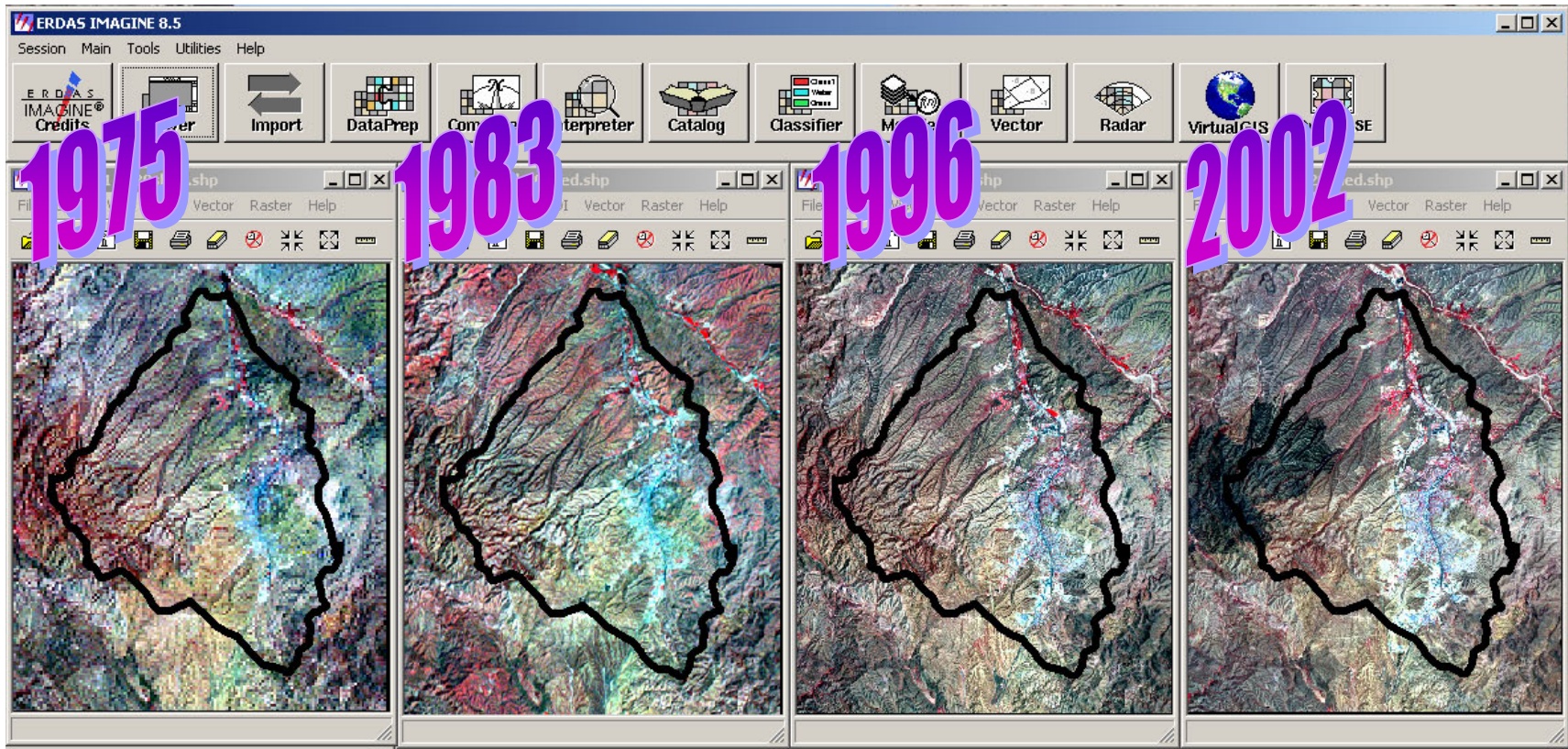


Figure 6: Landsat imagery portraying the Ambos Nogales watershed over time (1975-2002).

Interpretation and analysis of the Landsat imagery required acquisition and processing, georectification, and classification of urban and residential land use. These data were then used to produce maps of the past and current urban extent in the region. Because the classification of urban extent is subject to the analyst's decision rules during the urban-mapping process, the values listed in this study are only approximations.

Identification of features by using remotely sensed data involves use of computer software with the ability to identify pixels on the basis of their spectral reflection properties and statistical estimates. We used the ERDAS Imagine 6.1 software in this study. The spectral-reflectance value of an urban surface was used to identify urban extent. In these color infrared images, urban surfaces are characteristically blue to white, vegetation areas light to dark red, and soil yellow to light brown (Bell and others, 1995).

Clustering methods, called unsupervised classification procedures, were applied to locate the spectral classes into which the pixels of urban definition are assigned. Datasets were run through the ERDAS Imagine isodata algorithm, using six iterations each, to create signature sets and imagery categorized into 20 classes. The isodata-clustering algorithm uses the minimum-spectral-distance formula to form clusters, beginning with arbitrary cluster means. Classes correspond to the spectral signatures of dominant land-use and land-cover types; signatures that appeared to be urban areas were isolated for future analysis. Using the isodata classifications and registered original true-color Landsat imagery, urban areas were identified and manually digitized at 1:25,000 scale for each year of interest (see results displayed in fig. 7).

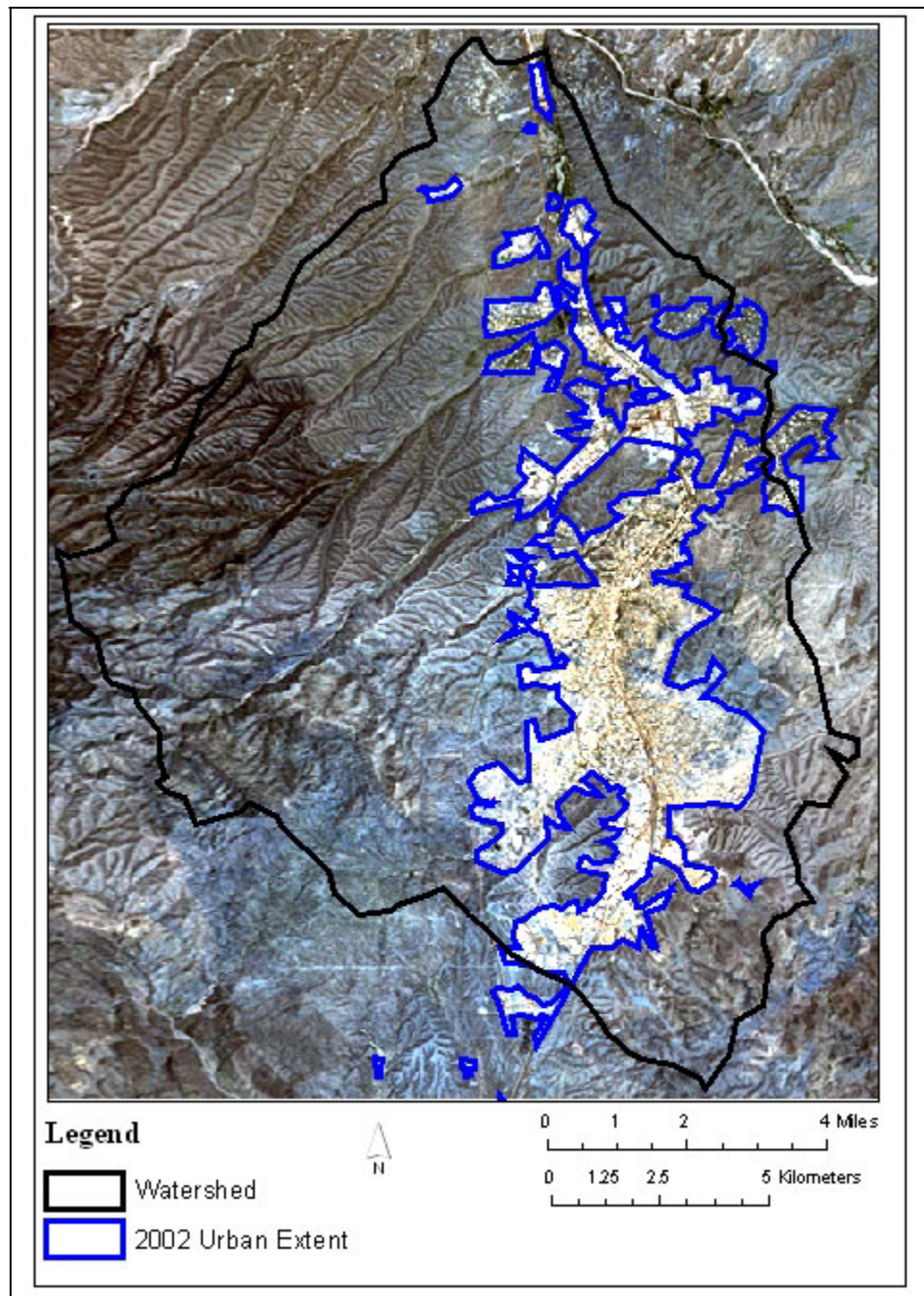


Figure 7: Digitized 2002 urban-extent polygon overlain on 2002 Landsat image.

The urban boundaries in 1995 and 2002 that were digitized for Nogales, Ariz., were compared with those identified by the 2000 U.S. Census. From this visual analysis, the

boundaries are apparently at a higher resolution and more accurate than the Census data (fig. 8).

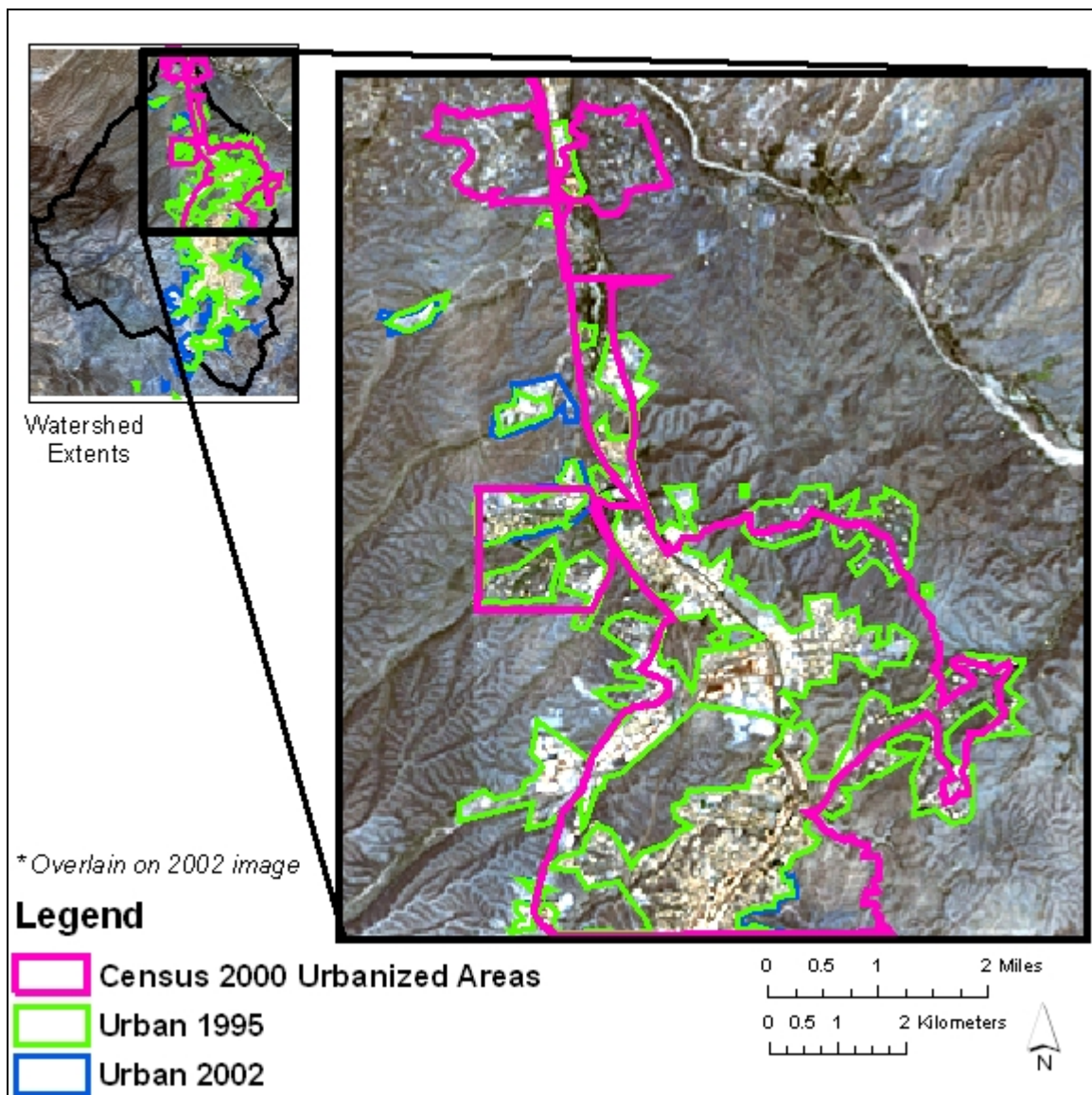


Figure 8: Comparison of digitized urban extents in 1996 and 2002 with urban areas identified by the 2000 U.S. Census in Nogales, Ariz.

These datasets were then combined in a GIS to display polygonal features of urban extent at the different time periods (fig. 9).

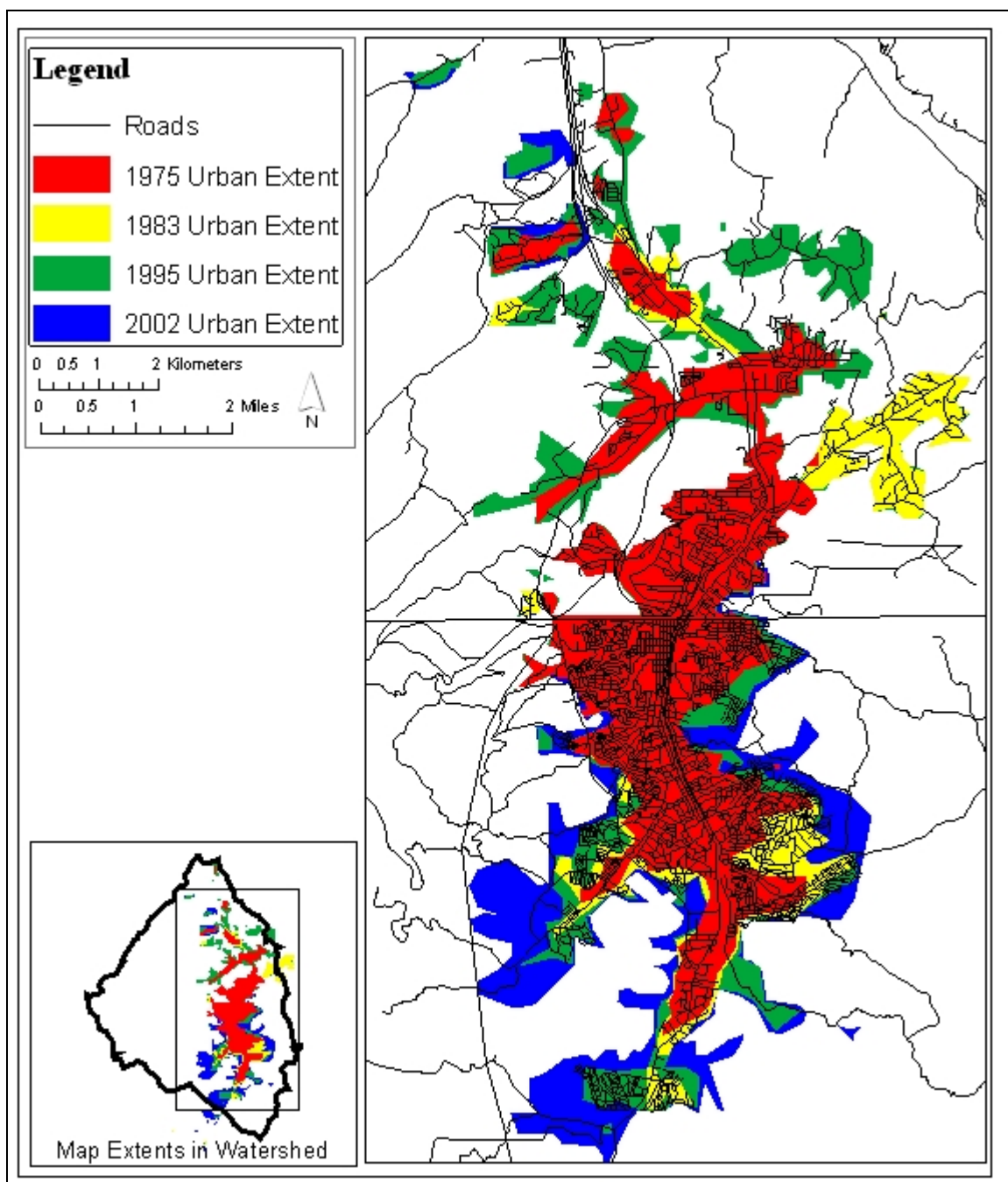


Figure 9: Urban growth in Ambos Nogales over 27 years.

Change Detection and Discussion

Polygons were rasterized by using ArcINFO's GRID module and area calculations were summarized and compared in Microsoft Excel software (table 2). According to the Urban Watershed Forestry Manual (Cappiella and others, 2005), after 1975 the Ambos Nogales watershed can be defined as an "urban watershed or subwatershed" because it has more than 10% total impervious cover.

Table 2: Urban extents calculated from 1975, 1983, 1996, and 2002 satellite imagery.

Year	Acres	Hectares	% of Watershed
1975	6,026	2,438	9.6
1983	7,756	3,139	12.4
1996	10,877	4,402	17.4
2002	13,715	5,550	21.9

The Ambos Nogales urban area is growing rapidly (fig. 10) on a linear trend. If it continues to grow at this rate, by 2012, it will reach 16,000 acres (6,475 ha).

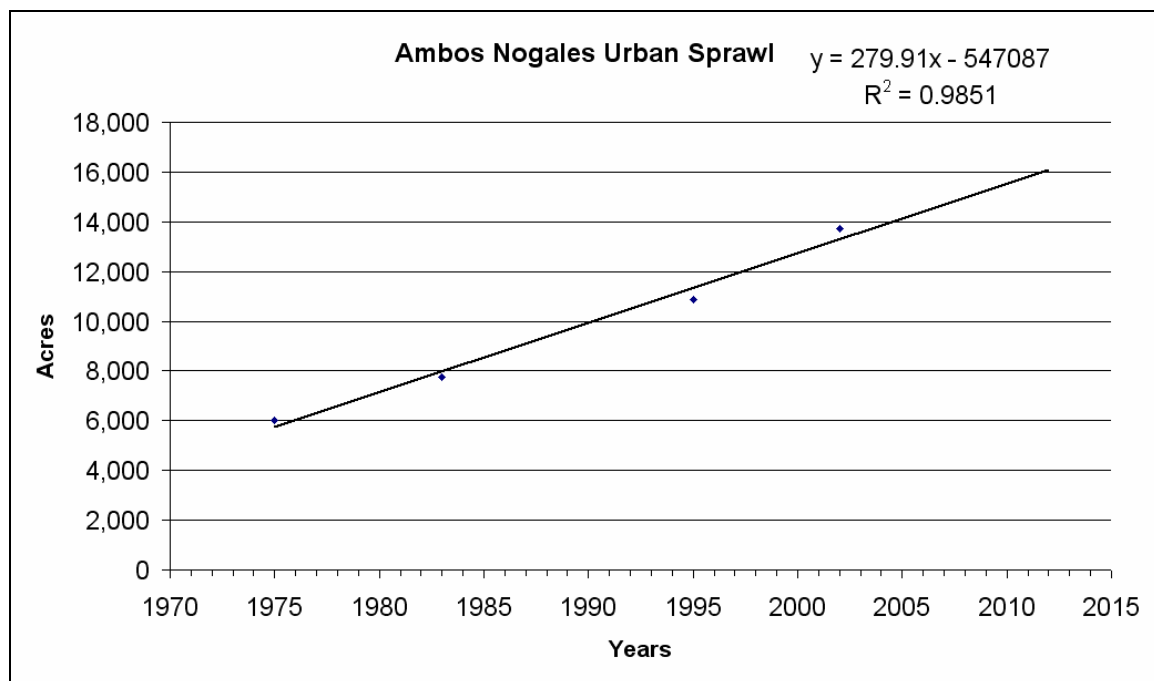


Figure 10: Urban growth of Ambos Nogales.

The implementation of NAFTA in January 1994 altered the growth rate in Nogales, Sonora, by creating new employment opportunities, luring many Mexicans to move to this border town (Varady and Mack, 1995). In dividing urban-extent measurements at the border, an analysis of these two cities was independently scrutinized. Apparently, population growth from 1996 to 2002 in Nogales, Ariz., was small (3% to compose its total urban extent), while in Nogales, Sonora, it was very large (34% to compose its total urban extent), supporting the theory that NAFTA may have influenced settlement in Nogales, Sonora, since its implementation (fig. 11).

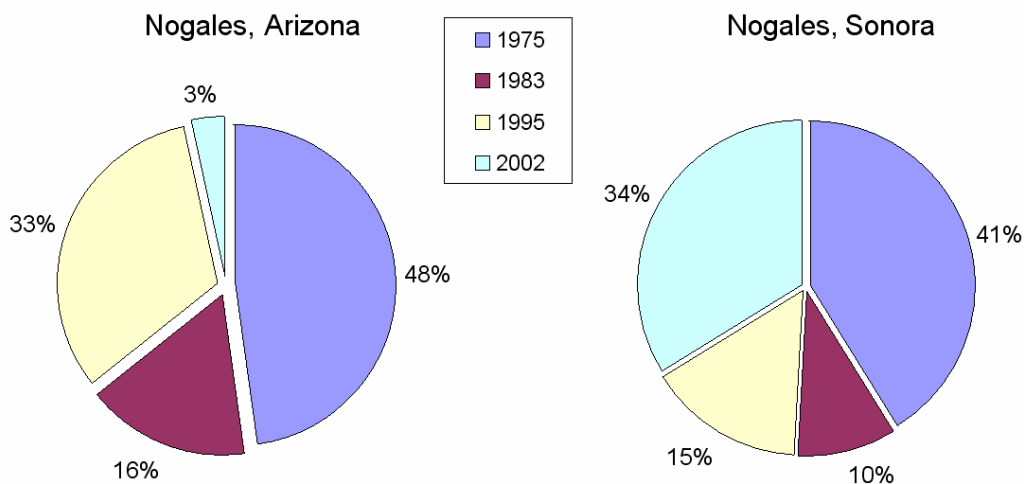


Figure 11: Pie charts of total urban extent in both Nogales, Ariz., and Nogales, Sonora over time.

While the urban extent of Nogales, Ariz., has more than doubled, that of Nogales, Sonora, has almost tripled (fig. 12). Both cities are still growing; however, Nogales, Sonora, has expanded much more rapidly, possibly attributable to industrialization.

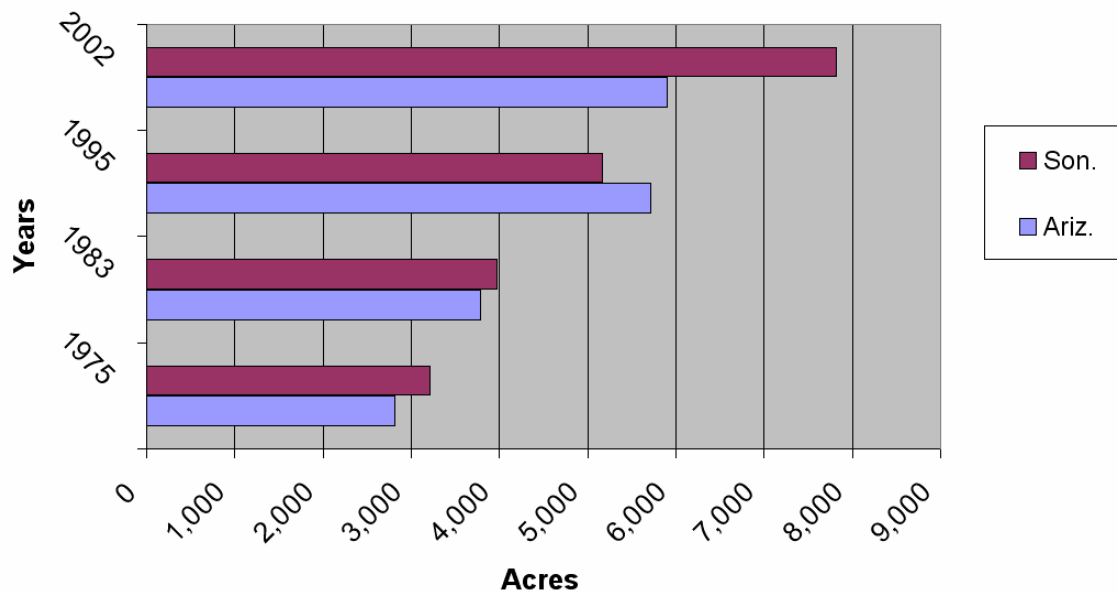


Figure 12: Bar chart comparing urban-growth rate in Nogales, Ariz., and Nogales, Sonora.

Colonias of Ambos Nogales

An introduction to this research to the community took place at a meeting on September 15, 2003, in the offices of the City of Nogales, Ariz. Arizonan participants included city and county officials, representatives of local nongovernmental organizations, and Arizona State University and University of Arizona faculty and students; Sonoran participants included city officials, and professors from the University of Sonora, Hermosillo. HUD and USGS personnel introduced the Colonias Monitoring Program and the GIS database, followed by additional participants who shared their experience with and interest in the use of GIS as a research and monitoring tool in Ambos Nogales (figs. 13, 14, and 15).



Figure 13: Participants in initial meeting for Ambos Nogales Colonias Monitoring Program, students and faculty of the University of Arizona interact with historian from Nogales, Sonora.

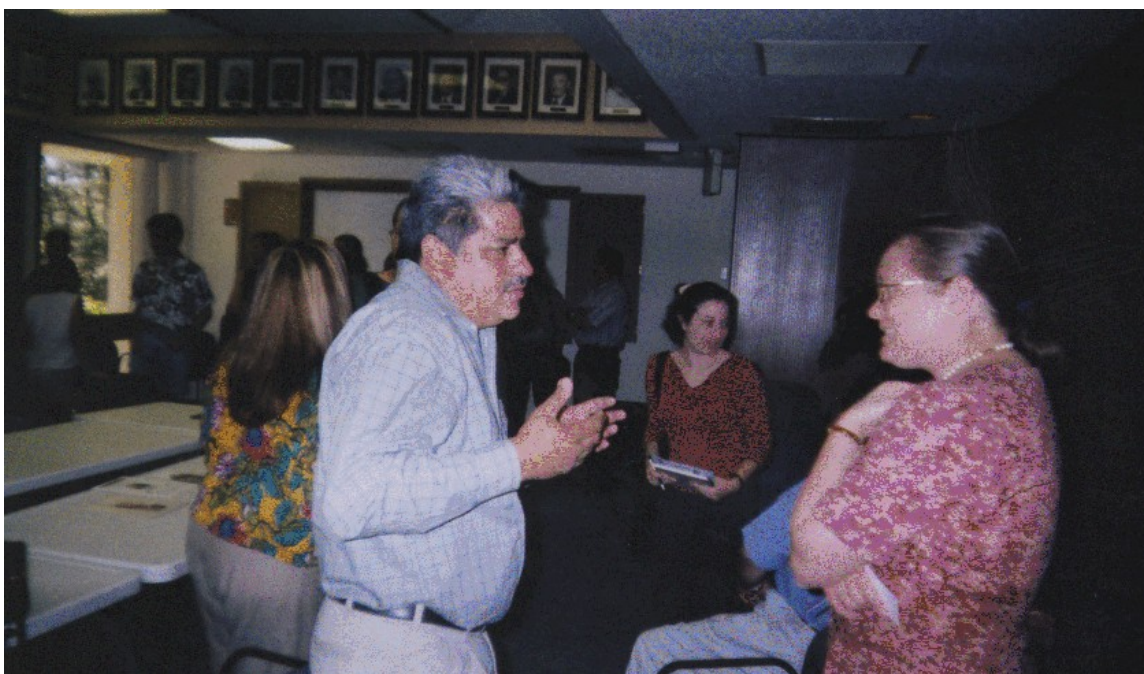


Figure 14: Participants in initial meeting for Ambos Nogales Colonias Monitoring Program, with Juan Mendoza, architect in Nogales, Sonora, and Michelle Kimbel-Guzman, Arizona Department of Environmental Quality, in foreground.



Figure 15: Participants in initial meeting for Ambos Nogales Colonias Monitoring Program, Arizona State University faculty interact with HUD staff.

In addition, a series of telephone interviews, e-mail exchanges, and individual meetings were held to collect personal information about conditions of local housing and infrastructure, as well as existing GIS data. This information was used to delineate new *colonia*-like boundaries in Ambos Nogales.

Nogales, Arizona

Using their knowledge of the area, as well as of sewerline and waterline localities, community members, especially Eduardo Delgado and Gerardo Calza (city of Nogales, Ariz., Department of Public Works), Mike Alcala (environmental health coordinator, Santa Cruz County Health Department and U.S. Department of Health), Cynthia Shoemaker (teacher, Nogales, Ariz., elementary school) and Hector Bajorquez (city of

Nogales, Ariz., housing authority) examined hardcopy maps and helped to identify *colonia*-like neighborhoods in Nogales, Ariz. (figs. 16-18).



Figure 16: Michael Alcala (environmental health coordinator, Santa Cruz County Health Department and U.S. Department of Health), Cynthia Shoemaker (teacher, Nogales, Ariz., elementary school), and Teresa Leal (coordinator, Border Links in Nogales, Sonora) examine maps of Ambos Nogales to identify *colonia*-like neighborhoods.



Figure 17: Eduardo Delgado and Gerardo Calza, from the city of Nogales, Ariz., Department of Public Works identify neighborhoods lacking adequate infrastructure from the city to be designated as *colonias*.



Figure 18: Hector Bajorquez, from the city of Nogales, Ariz., Housing Authority, points out neighborhoods along the border that have inadequate housing conditions, to be designated as *colonias*.

Colonias previously recognized by the USDA, including the City of Nogales, Chula Vista (fig. 19), Firestone Gardens, and Pete Kitchens (fig. 20) were included in this study.



Figure 19: Typical housing in Colonia Chula Vista, Nogales, Ariz.



Figure 20: Potrero Creek running through Colonia Pete Kitchens, Nogales, Ariz.

New residential developments were identified in this study to be designated as *colonias*. The Valle Verde area was designated because it does not receive water from the city of Nogales. Newly designated Beatus Estates *colonia*, though containing high-quality houses, has no access to the city sewer and water supplies, and so most houses remain on septic tanks not maintained by the city. Colonia Las Lomas is an expansion of the older Colonia City of Nogales. Colonia Preston is gathered around an industrial zone, and the houses are of poor quality, having been built quickly. Those *colonia*-like neighborhoods that are clustered around the border, including Colonia Las Alisos, Colonia Casas de Anza, and the Colonias Southwest and Southeast, were designated according to the year in which the houses were constructed. This is the historic district, and the houses are deemed inadequate to live in. All the *colonias* in Nogales, Ariz., were delineated on the map (fig. 21).

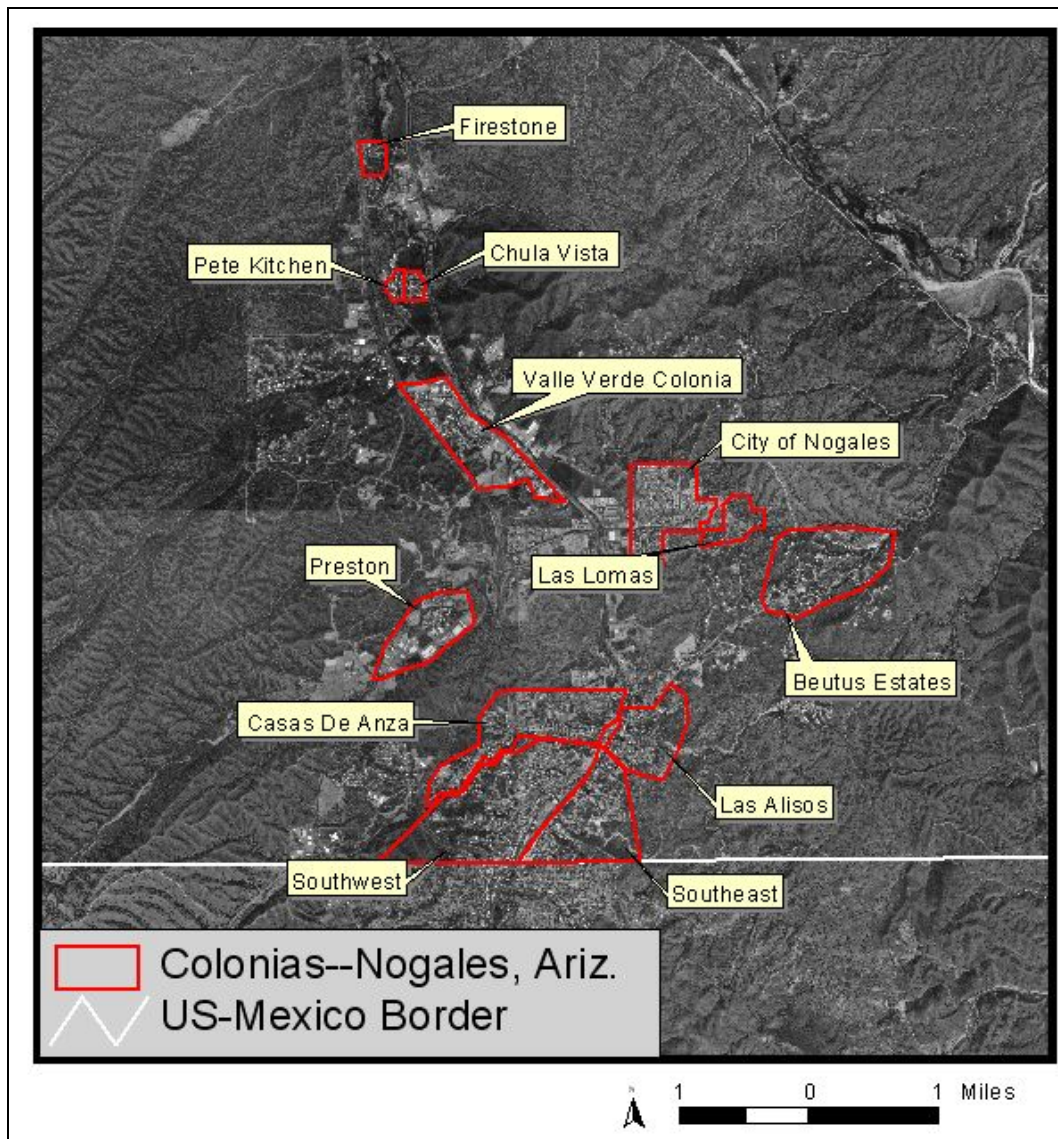


Figure 21: Colonias of Nogales, Ariz.

Nogales, Sonora

In Sonora, this project identifies poor neighborhoods lacking basic services as *colonias marginales*. Previous studies in Nogales, Sonora, have described housing composed primarily of wood, brick block or cement, and paper carton, with considerable numbers of dwellings having dirt floors. Residents also reported that many dwellings are infested with insects and rodents (Sadalla and others, 1998). Varady and Mack (1995), in

a study at the Udall Center at the University of Arizona, describe Mexican *colonias* as small informal, unstructured settlements that were created to accommodate the high influx of workers who relocated after policy implementation. In 1999, only 50% of the residents of Nogales, Sonora, had piped water or connections to sanitary sewers; however, local governments are now receiving assistance to provide potable water (Brown and others, 2003).

With the help of community members from the city of Nogales, Sonora, in particular Alberto Suárez Barnett (historian of the Nogales Municipality, Sonora) and Cesar Espinoza Rodriguez, Hector Rocha (La Comisión de Agua Potable y Alcantarillado del Estado de Sonora (COAPAES)) (fig. 22), and Teresa Leal (coordinator, Border Links in Nogales, Sonora) (fig. 16), areas lacking in adequate housing or infrastructure were identified as *colonias marginales* (fig. 23).



Figure 22: Hector Rocha and Cesar Espinoza Rodriguez, from La Comisión de Agua Potable y Alcantarillado del Estado de Sonora (COAPAES) and Alberto Suárez Barnett, a yistorian of Nogales Municipality, Sonora, identify *colonias marginales* lacking infrastructure and adequate housing conditions in Nogales, Sonora.

These *colonias marginales* were previously recognized by the Urban Office of the Secretary of Infrastructure and Ecology of the Government of the State of Sonora (Secretaría de Infraestructura Urbana y Ecología (SIUE)) as homogeneous areas in the city containing houses that are either “popular dwellings” or homes of “precarious construction.”

“Popular dwelling” homes were built by their owners, some long ago and some more recently, and so their construction quality varies considerably. “Precarious construction” homes were built mainly with discarded materials, although their

construction quality also varies considerably. Thus, this classification would be considered an average of the quality of the homes in each particular zone.

According to these definitions and local knowledge, the following sectors were designated *colonias marginales* in terms of the project's scope: Rosario, Buenos Aires, Benito Juarez, Croc, Esperanza, Valle El, Cinco de Mayo, Veracruz, Los Tapiros, Buena Vista, Lomas de Nogales, Solidaridad, Flores Magon, Las Torres, Del Rastro, Maza de Juarez-Margarita, San Carlos, and one unlabeled by SIUE, Obrera (fig. 23).

Colonia Buenos Aires, built on the steep hills just east of the downtown area and abutting the border, is one of the most susceptible to flooding; mud and debris clog drainage channels and send water roiling down the street, lifting chunks of pavement (Ibarra, 2003). Community members fear that because the streets within this *colonia* are built over Nogales Wash, they are at risk to collapse. Locals are forced to dig out silty mud that is carried into their homes by floodwaters. Some blame a landing-mat fence along the border, which blocks a wash that once ran freely into the United States (Ibarra, 2003).

According to Teresa Leal, coordinator for Borderlinks and local activist in Nogales, Sonora, Colonia Croc is believed to be a high-crime neighborhood with poor housing. Colonia Colinas del Sol is an extension located southeast of the Colonia Croc; its residents are poor and commonly squatters. The neighborhood is located in the smugglers corridor next to Kino Springs, with homes built on steep slopes and lacking potable water. Colonia Cinco de Mayo contains an Infonavit cluster (public housing) that is poor, as well as the Colonia Pueblo Nuevo, which was the first squatter community in the 1970s (personal communication, 2003).

According to Leal, Colonia Veracruz hosts the neighborhood Bella Vista, which contains the city dump. Most of the people living there scavenge housing materials from the dump. Colonia Los Tapiros is located almost in the center of town, next to Colonia Granja and east of Colonia Encinos; it is a 20-year old settlement and especially vulnerable and poor. Colonia Bueno Vista includes a neighborhood called El Pozo (“the Well”) that contained a well which is now leaky and dry, and is also reported to be located on contaminated land (personal communication, 2003).

According to Leal, Colonia Lomas de Nogales is located amid the railroad tracks, which extend to Guatemala. It is rumored that burnt motor oil is changed and dumped here to abate the dust, despite the numerous squatters who live there. Nogales Wash also flows through this area, making it a potential carrier of toxins downstream and across the border. In the northern part of the area, some research has demonstrated high rates of death incurred from brain cancer in young children (personal communication, 2003).

According to Leal, Colonia Solidaridad is located on an underground methane gas source, where an underground fire burns continuously beneath a landfill and holding tanks. Colonia Flores Magón is located just north of Colonia Las Torres and is also quite poor. Colonia Las Torres, home to new squatters, is located in a dusty area (personal communication, 2003).

According to Leal, Colonia Margarita Maza de Juarez and the area to the south (Colonia Luis Donaldo Colosio) are crucial because they are just east and downstream from a dam; this is one of the most recently developed *colonia* areas. Colonia Represo, also one of the most recently developed, can be considered an extension of Colonia Colosio (west of it and up the steep hills); it is located almost on top of the damsite and

so is especially vulnerable to flooding during regular rains. Colonia Obrero is located next to the “red light” district, known to be a high crime area full of sex-industry workers (personal communication, 2003).

Those federally subsidized areas identified by community members and also as “social interest developments” by SIUE are considered *colonias marginales* in this project. They receive support in regards to housing and infrastructure, including the sectors of Colonias Modulo Social "Periferico Norte,” Pima I, Heroes, Canoas, Encinos, Jardines del Bosque, Los Olivos, Los Virreyes, Villa Sonora, and Nuevo Nogales.

According to Leal, Colonia Pima I consists of multifamily public housing for teachers and bureaucrats. Colonia Heroes consists of old housing, based around a cemetery. Colonia Encinos has intense squatter movements. Colonia Nuevo Nogales and Colonia Villa Sonora consist of government subsidized homes that locals call *los hoyos de la paloma* (pigeonholes) because they were built quickly on a hill. These high-density homes lack water or garbage facilities (personal communication, 2003).

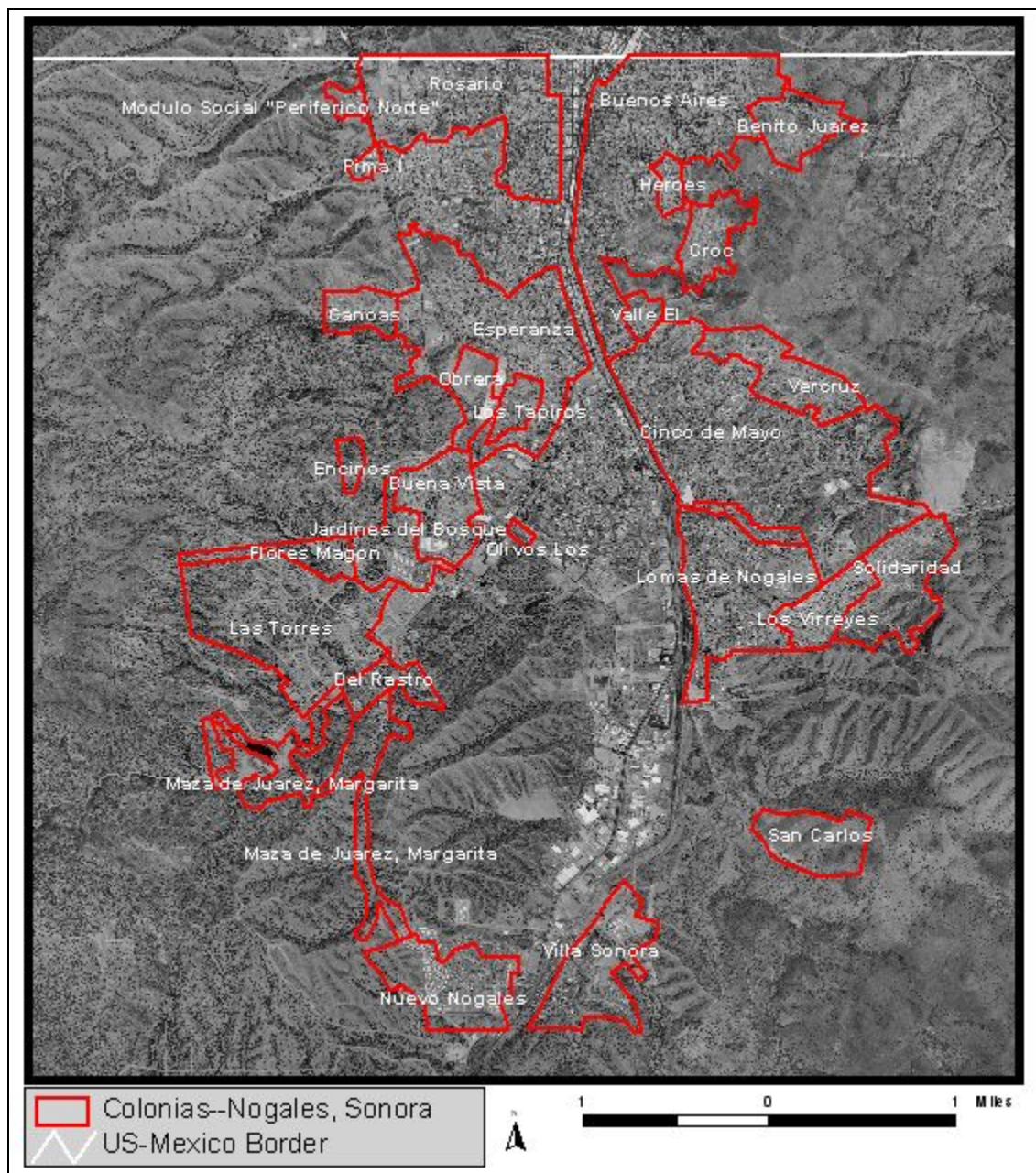


Figure 23: *Colonias marginales* of Nogales, Sonora.

Colonias Development

Overlaying the vector datasets on the satellite imagery helps to define each *colonias* development over time (fig. 24).

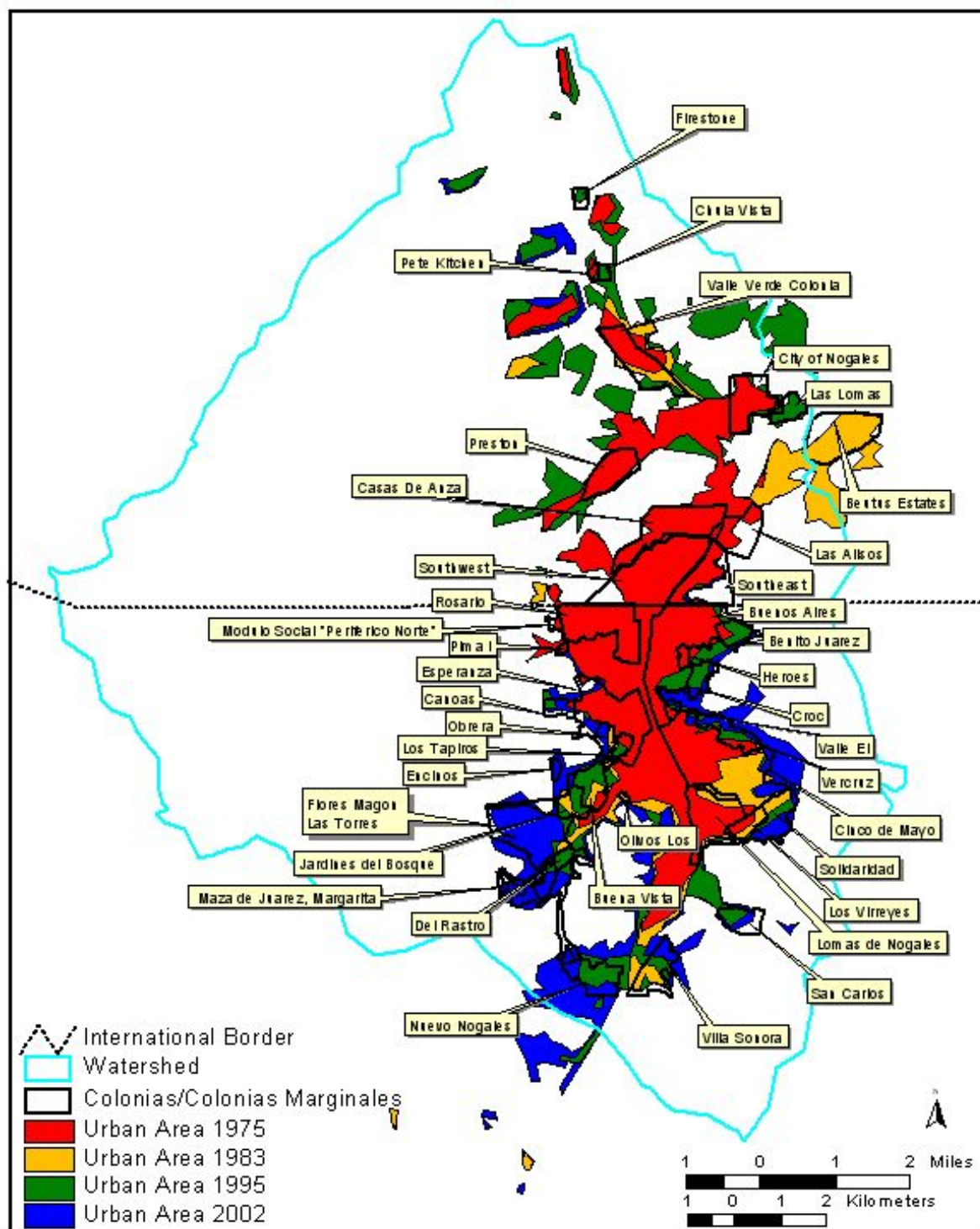


Figure 24: *Colonias* and *colonias marginales* development mapped over a 27-year time period.

The development of *colonias* in Nogales, Ariz., began before 1975. Most of these inner-city *colonias* are deemed so because their housing is believed to be inadequate, most likely owing to their year of construction. *Colonias* identified since 1983 include the area known as Beatus Estates, which was developed on hillsides without city sewer or water provisions. Colonias Firestone and Chula Vista were introduced in 1995, but no new *colonias* were introduced by 2002.

The development of *colonias marginales* in Nogales, Sonora, has been steadily increasing with urban growth throughout the years. *Colonias marginales* appear to follow the city limits in a regular pattern. One conclusion from this study is that people in Nogales, Sonora, generally develop housing as close to the city center as possible, assuming those conditions are acceptable to do so.

Web-Based Interface

Through a collaborative effort with the University of Arizona's School of Natural Resources, Advanced Resource Technology Group, a Web portal was opened to support Ambos Nogales research (http://crossborder.arizona.edu/colonias/n_project.htm), and the geospatial database has been uploaded to a map service for the purpose of Web-based distribution (fig. 25).

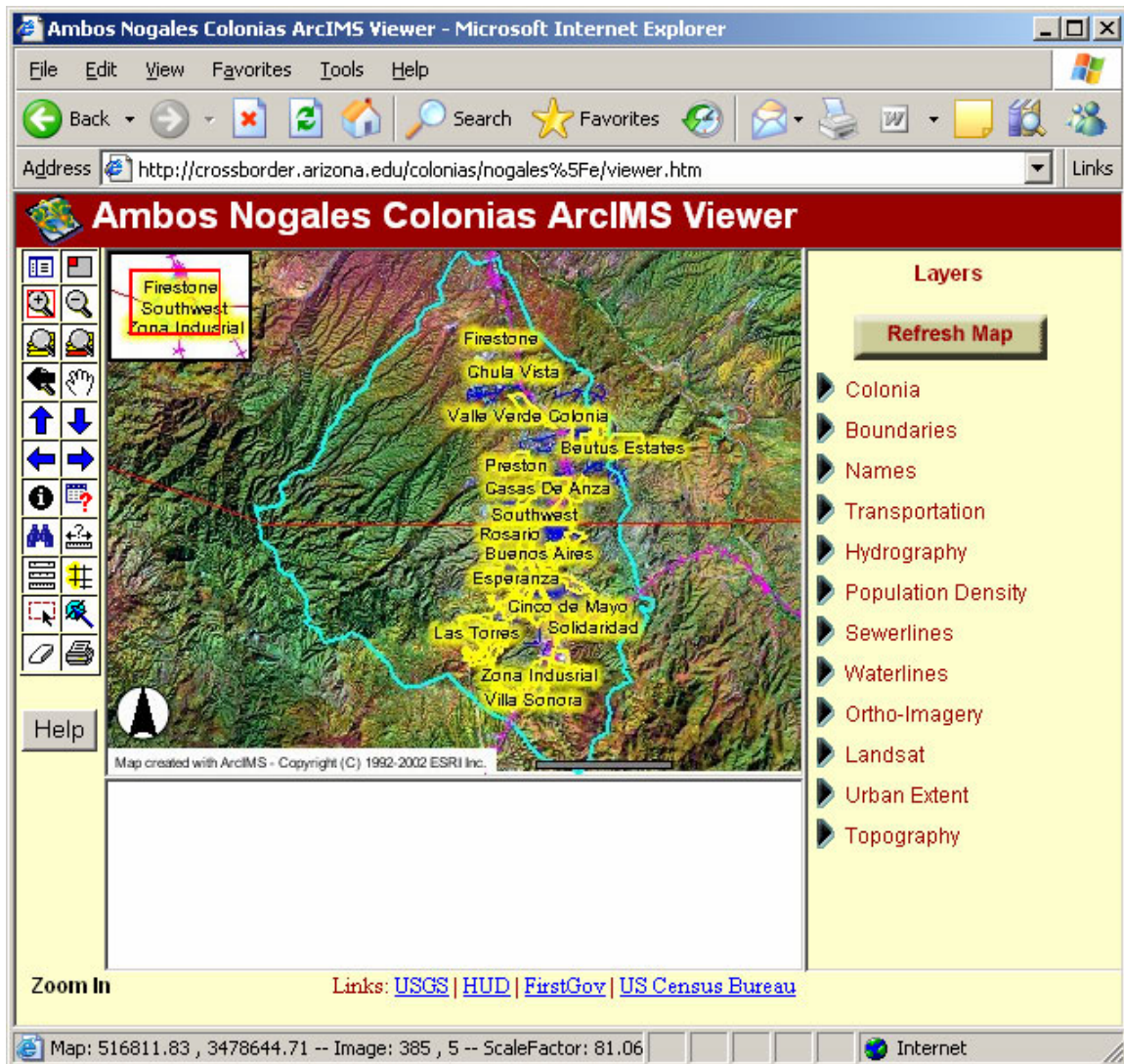


Figure 25: ArcIMS *colonias*-mapping Web site portraying datasets in Ambos Nogales (http://crossborder.arizona.edu/colonias/nogales_e).

Delivery of Product/Training

The geospatial database was compiled in cooperation with many different people within the communities of Ambos Nogales. Hard copy maps, describing sewerlines, waterlines, aerial photographs, and *colonia* boundaries, were supplied on request to interested parties. Fact sheets describing the project were composed and distributed to multiple community groups and nonprofit organizations (Norman and others, 2004a). Associates were contacted via e-mail and telephone. Regular e-mail and newsletters

describing the status of the project were sent to the people on the contact list. The project was also presented at the Arizona Geographic Information Council (AGIC) GIS Education and Training Symposium at the Prescott Resort and Conference Center in Prescott, Ariz., on October 27-29, 2004 (Norman and Austin, 2004).

Results indicate that providing at least a minimal amount of GIS training is essential if the Colonias Monitoring Program's border databases are to be widely and successfully used by community members. One of the simplest and most effective forms of such training is introduction to the databases themselves. This type of training involves interactive, hands-on sessions during which community members learn how to use the Web-site viewers to seek and overlay information.

On March 15, 2005, an "Ambos Nogales Urban Planning GIS Workshop" was held at the Santa Cruz County Complex, 2150 North Congress Drive, Room #110, in Nogales, Ariz. from 2:30 to 5 p.m. to demonstrate utility and access to the newly digitized geospatial dataset. This was a hands-on workshop to introduce the dataset to the community. No previous GIS experience was necessary, and the first 20 people to register held available seats. A tutorial was designed and presented to describe access to the datasets via the Internet (see app. A). Registered participants included the city of Nogales, Ariz. Planning Department, Cronista Municipal de Nogales (Sonora), the Urban Development Planning Department of Nogales (Sonora), Friends of the Santa Cruz River, Santa Cruz County GIS and Grant Writing, Noteworthy Services, the U.S. Public Health Service, the Santa Cruz County Health Department, and A.J. Mitchell Elementary School of Nogales, Ariz. (figs. 26, 27).



Figure 26: Interested parties from the U.S. Health Service, Santa Cruz County, Nogales, Sonora, and Nogales, Ariz., work through the Ambos Nogales self-paced GIS tutorial.



Figure 27: Sherry Sass (Friends of the Santa Cruz River) and Scott Anderson (A.J. Mitchell Elementary School, Nogales, Ariz.) learn about the Ambos Nogales database.

Conclusions

A suitability map was generated on the basis of an area's ability to support *colonias* that identifies areas more suitable to develop through access to, or potential proximity to, preexisting infrastructure (fig. 28). This guideline is useful for developers in planning the most advantageous sites for new infrastructure or housing developments across the border. All the layers portrayed on the suitability map and other reference data created and served through this effort are meant to assist *colonia*-like neighborhoods to identify themselves for earmarked *colonias* grants. By making this dataset accessible over the Internet, public information becomes readily available for the residents of this

community, who, according to a study by Pavri and others (2005), have good Internet access.

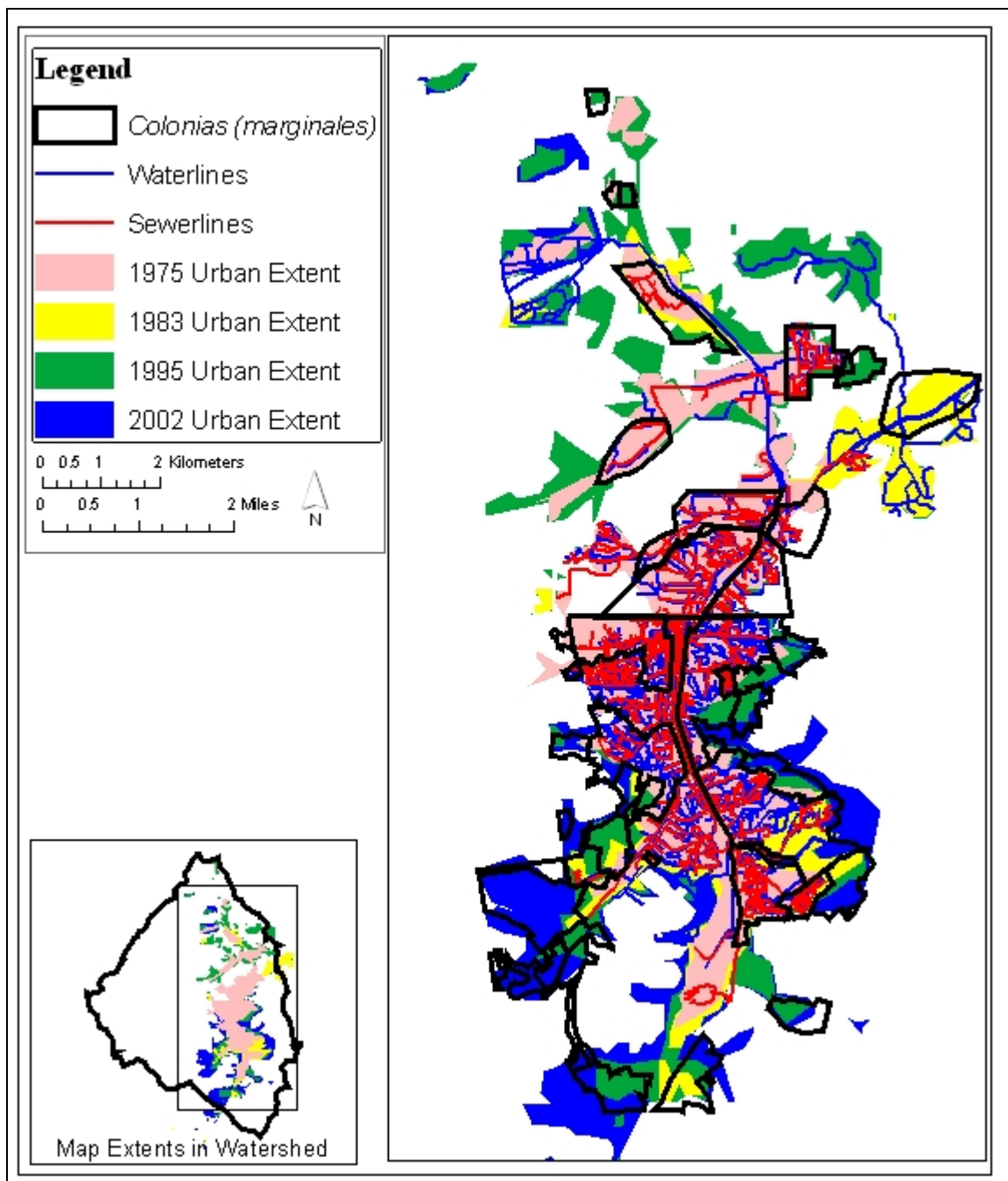


Figure 28: Suitability map of Ambos Nogales, showing *colonias*' proximity to preexisting infrastructure.

The HUD-USGS Colonias Monitoring Program has been designed to help United States-Mexican border communities reach their goals of improving housing and infrastructure and enhancing the quality of life for all their residents. Community leaders from the government, business, academic, and nongovernmental sectors of Ambos Nogales embrace the notion of community development and are engaged in numerous activities to achieve it. The Colonias Monitoring Program can become an important tool in their efforts. Continuing integration of the GIS-database compilation with the efforts of Federal, State, county, or city agencies is essential.


Through the identification of *colonias* in the United States or of *colonias marginales* in Mexico, this research aims to promote the financing of sustainable-development planning in these needy areas. By calling attention to these neighborhoods and providing tools to accurately map the infrastructure that may support them, local entities and interested parties can investigate the needs identified and create potential-cost analysis of implementing change over the Internet, free of charge and at their own pace.

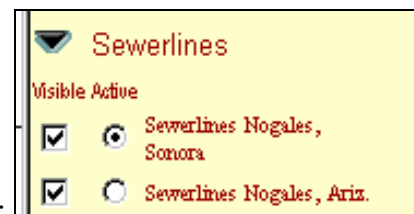
APPENDIX A: Ambos Nogales Urban Planning GIS Workshop Tutorial

To open the Ambos Nogales ArcIMS Viewer:


- 1.) Open the main Web page (<http://crossborder.arizona.edu/colonias/>), note option to click on “En español”, which was translated by Alberto Suárez Barnett, Cronista Municipal de Nogales, Sonora.
- 2.) Open the Viewer for Nogales/Nogales by clicking on the star in the map of Ambos Nogales.
- 3.) Close the viewer.
- 4.) Or you can open the Ambos Nogales Web site from the home page by clicking on the project called Ambos Nogales on the left menu.
- 5.) Click the subtitles in this project to quickly display "data", then "metadata" and pause here to examine the information describing the creation and projection of each dataset in the viewer.
- 6.) Open the metadata page for Nogales, Ariz. *colonias*, by clicking on the hyperlink and scroll down. This is a standardized format for Federal Geographic Data Committee (FGDC)-compliant geospatial data. Close the popup window, and open the Viewer
- 7.) Resize the Viewer to fill the screen-- the blue line is the Ambos Nogales watershed boundary.

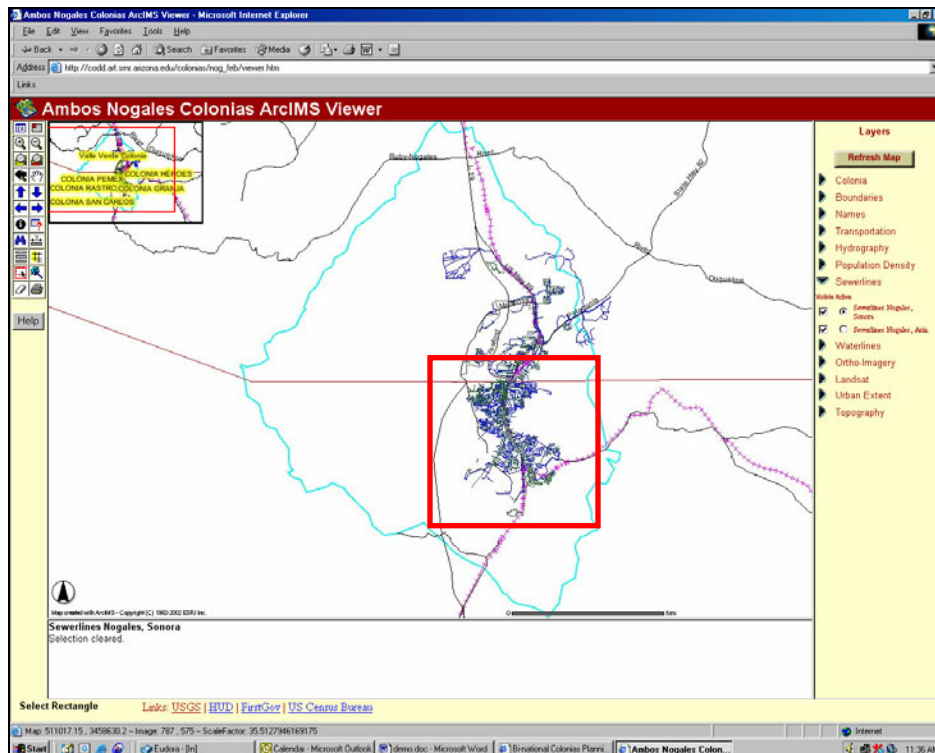
EXERCISE #1

- 1.) Using the “Expand Category” button located in the “Layers” List , open the category for “Colonias”, and turn off the “Visible” layers by clicking on the check-marked boxes.
- 2.) Open up the category for “Sewerlines”.



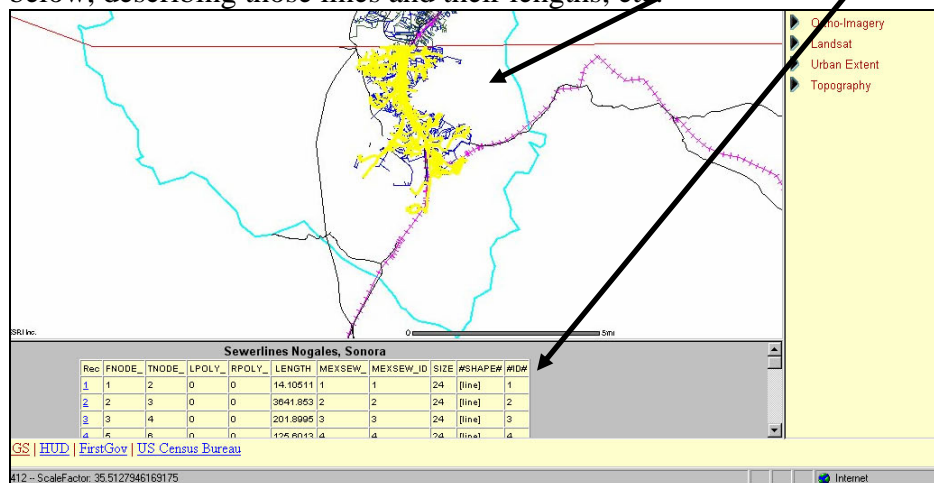
Make sewerlines in Nogales, Sonora, the active theme:


- 3.) Using the select rectangle, located in the toolbar to the left, , and select all the visible sewerlines in Nogales, Sonora, by drawing a box around them. The green lines running through the city represent sewerlines.

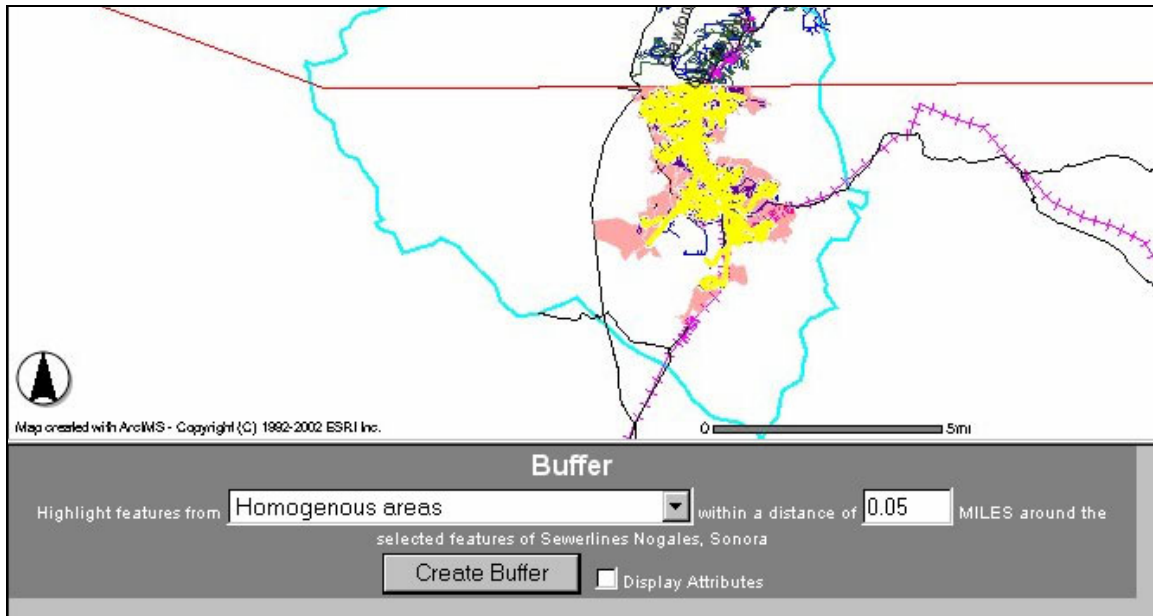


Make the box bigger than the visible data to ensure that all sewerlines in Nogales, Sonora have been selected. The select tool will select only the active theme data, and so anything inside the box that is not Nogales, Sonora, sewerlines will be excluded in this function.

After the features are selected, they will turn bright yellow, and a table will open up below, describing those lines and their lengths, etc.



- 4.) Use the buffer tool  to highlight the features from “Homogenous Areas”, or inhabited areas, within a distance of 0.05 mi around the selected features (Create Buffer). This may take a little while...



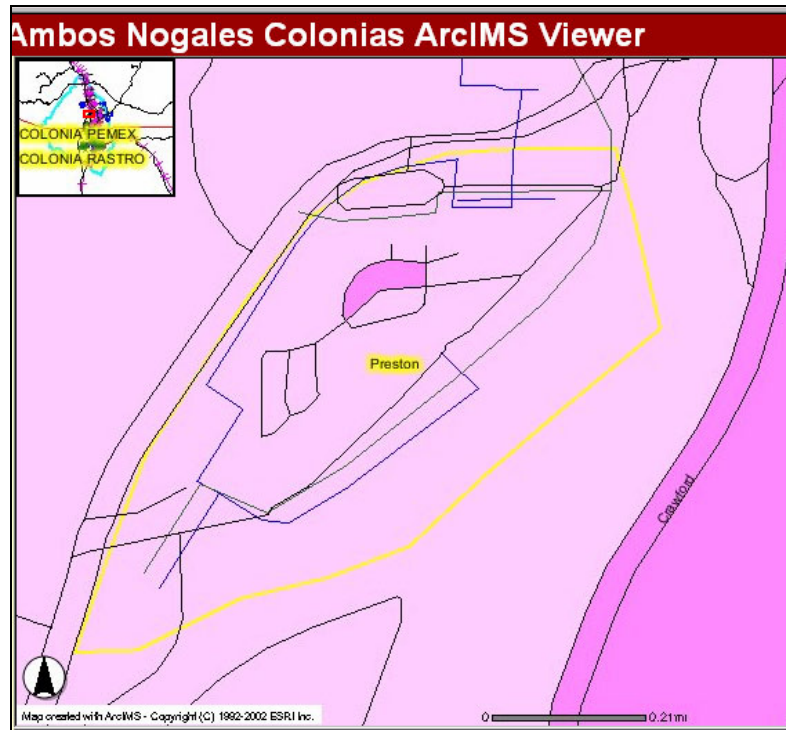
These homogeneous areas are less than 0.05 mi from the current sewer system, and construction costs would be less to connect them than other areas.

- 5.) Use the eraser to clear query results

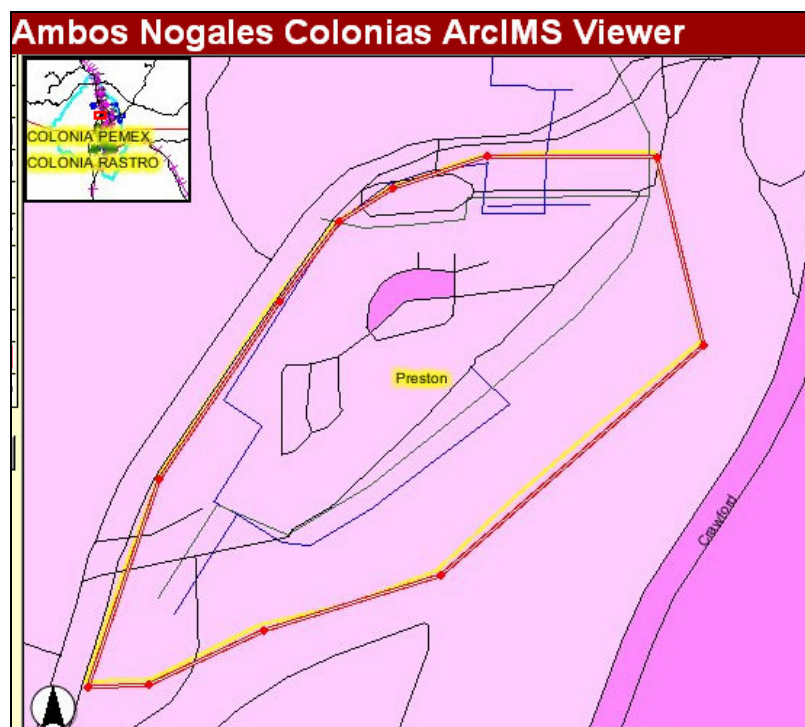


EXERCISE #2

- 1.) Turn on themes: "Roads Nogales, Ariz.", "Colonias Nogales, Arizona" and "Density of Households (US Census 2000)" --make "Density of Households (US Census 2000)" the active theme.
- 2.) Zoom into the colonia called "Preston":

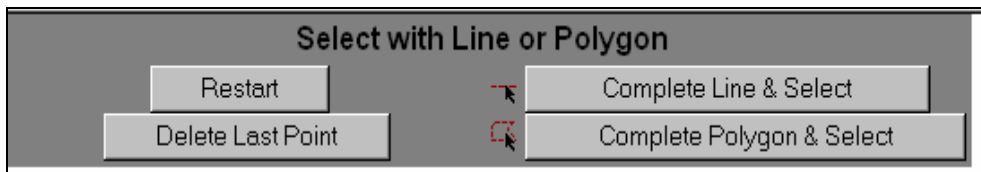


- 3.) Use the select-by-polygon tool  to draw a small rectangle within the boundaries of this colonia:

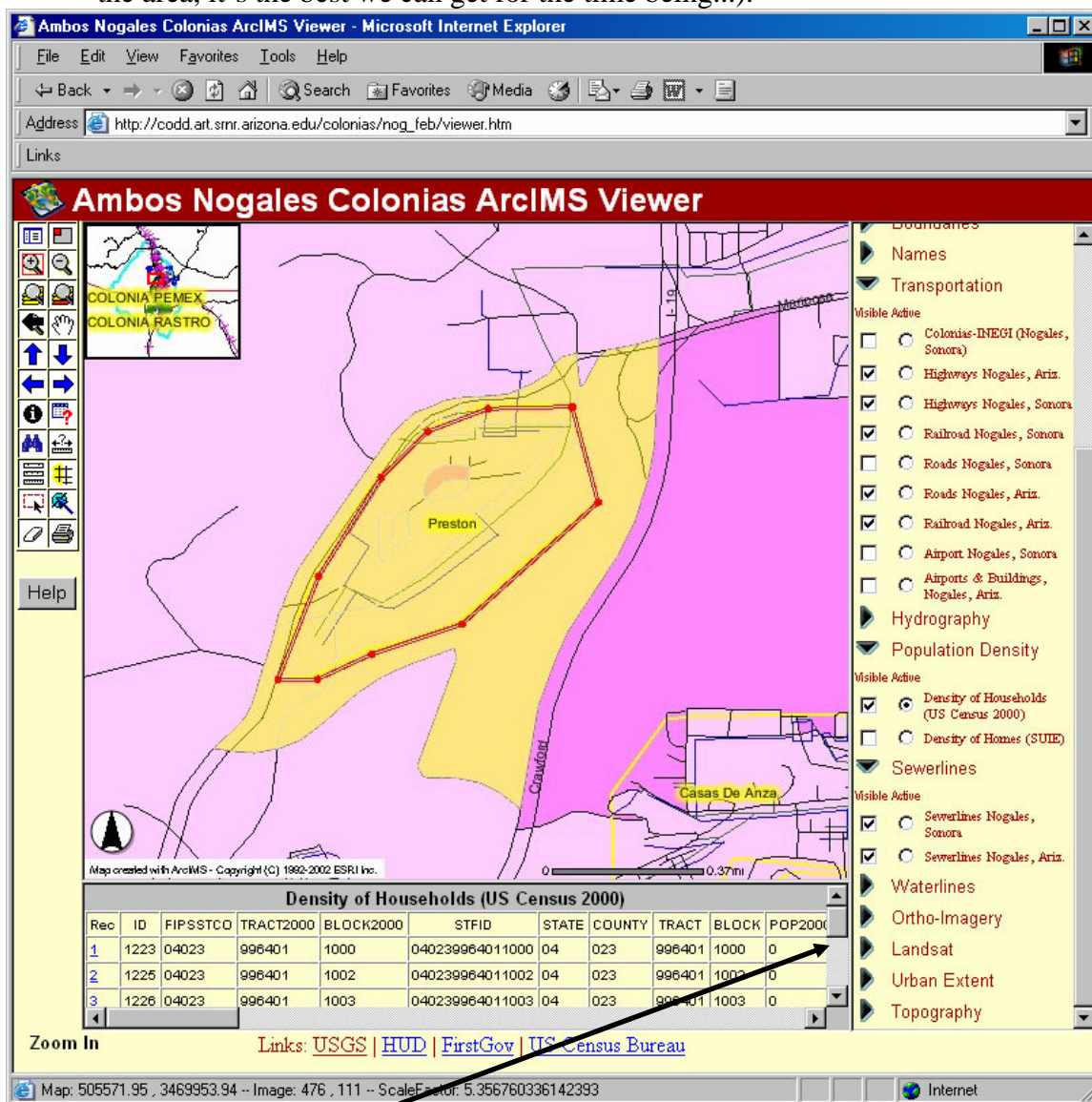


And then press the “Complete Polygon & Select” Button





- 4.) Notice that this button will select Census Blocks over the edge of the boundary defined, which is undesirable, but owing to lack of Census Designated Places in the area, it's the best we can get for the time being...).



Scroll through the table that appears below the viewer, pointing out that nine Census Blocks are identified within this *colonia*--then scroll back up to see the attribute name, and scroll to the right to see all the different data available.

- 5.) Population estimates, along with other valuable census information, can be acquired quickly by using this methodology for grant writing or city planning. A total of 491 people were counted in these clocks for Census 2000.

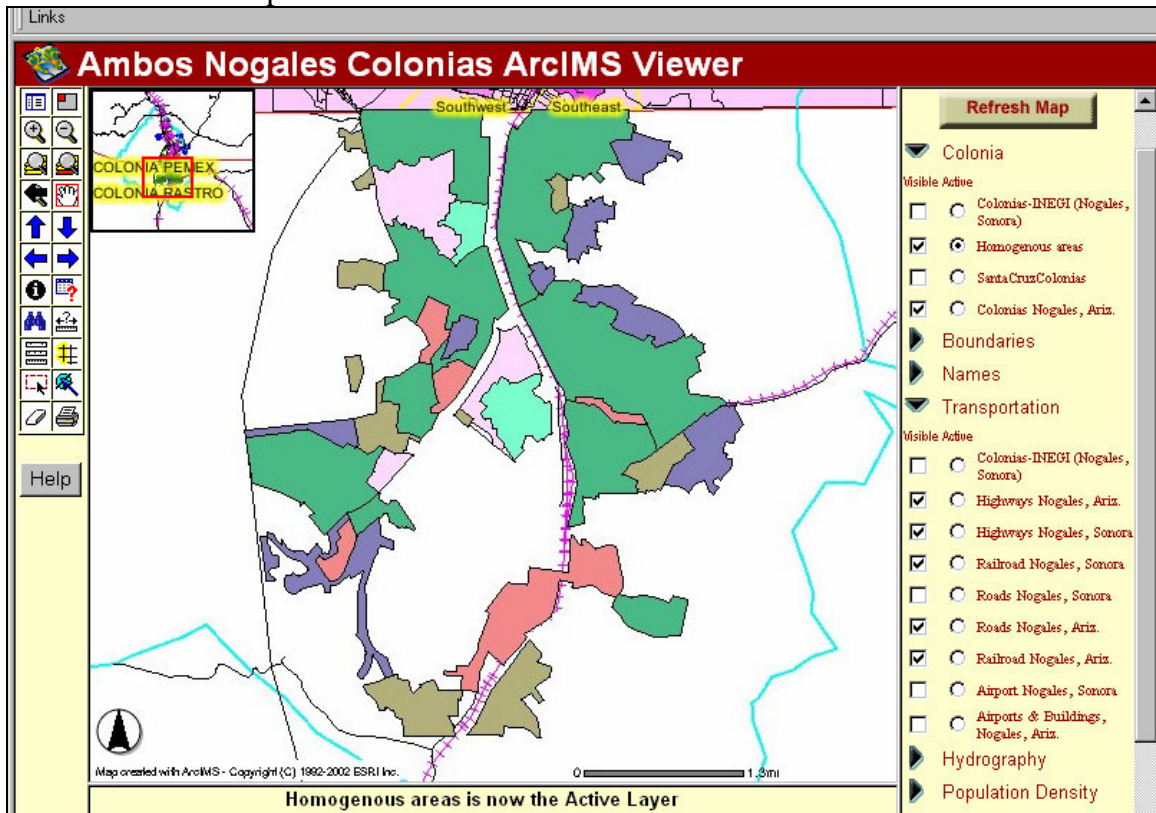
- 6.) Use the eraser tool to clear query results and the Zoom tool to full extent of the


project using that tool:




EXERCISE #3

- 1.) Zoom into Nogales, Sonora.
- 2.) Turn off all themes sewer and water.
- 3.) Turn on theme under colonias called "Homogenous areas", make active, and "Refresh Map".



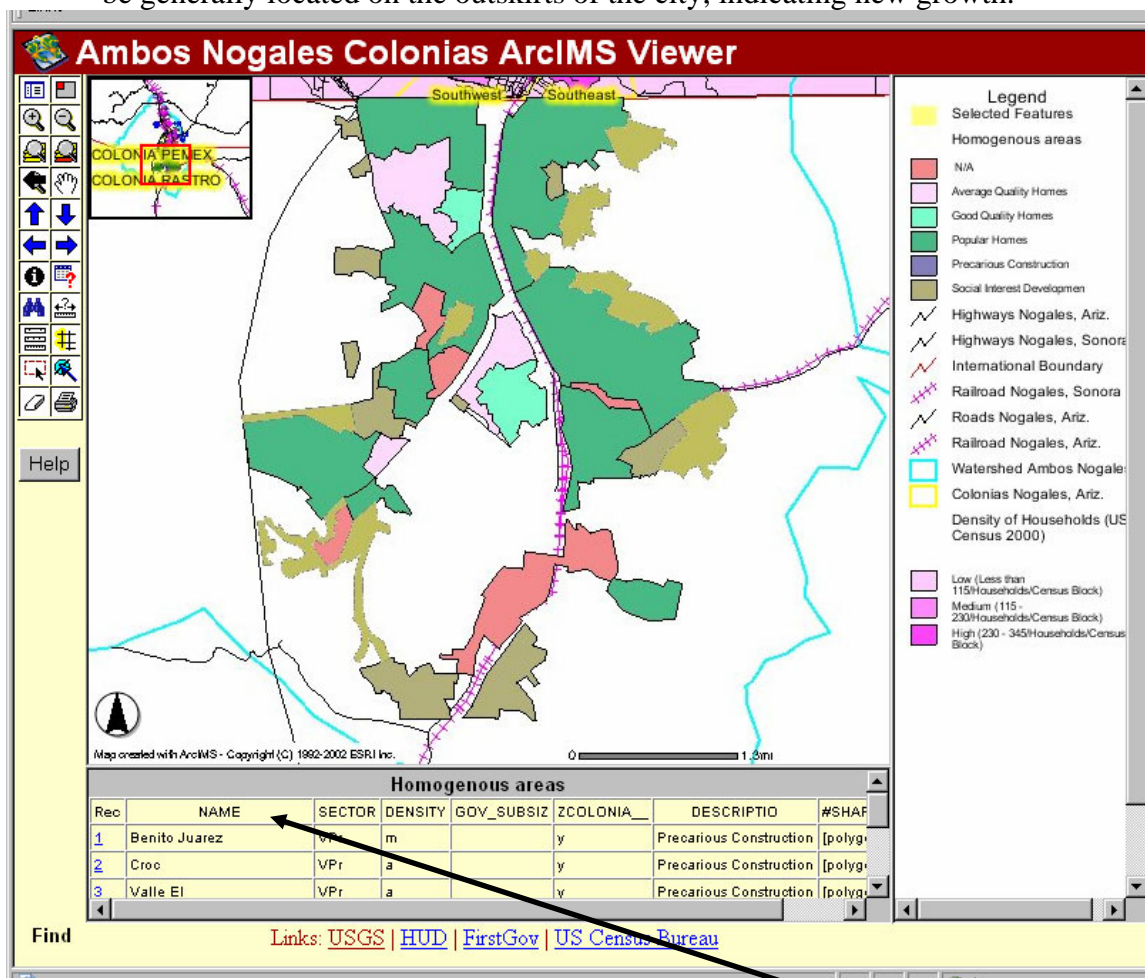
- 4.) Toggle the legend tool  to display the meanings of these colors, which were identified by the city of Nogales, Sonora:



5.) Select Find tool .

6.) Type in "Precarious Construction" string to find in theme (spelling counts!), and press the "Find String" button.

7.) Note that the blue color when selected turned olive green. These neighborhoods may be in need of subsidies to help bring the quality of homes up. They seem to be generally located on the outskirts of the city, indicating new growth.

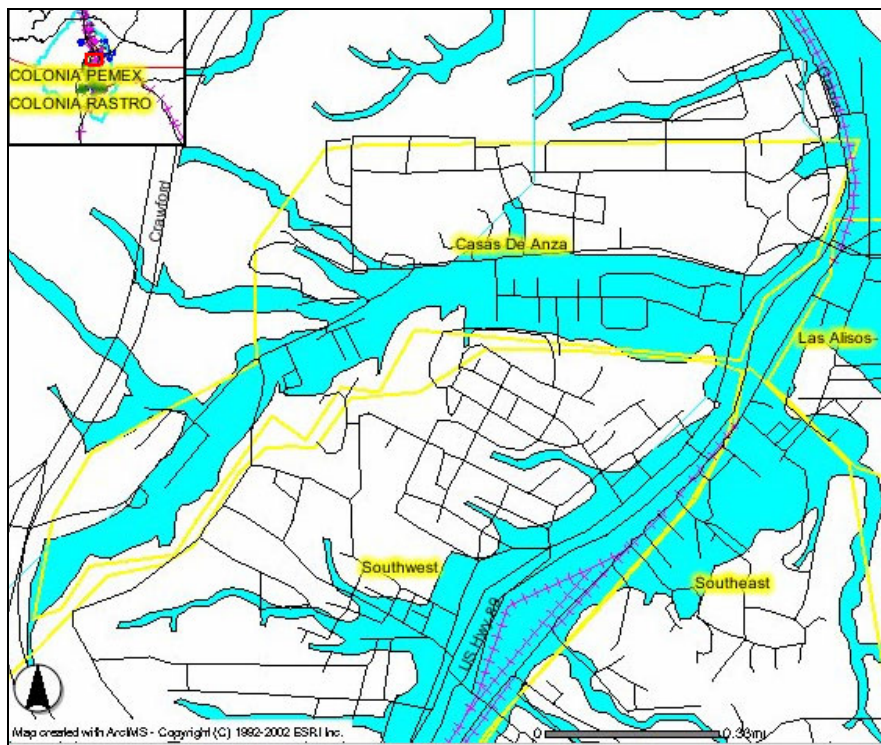


Also notice that the table below the viewer lists the names of these areas.

- 8.) Toggle legend back. Turn off “Homogeneous Areas” theme, along with the “Density of Households (US Census 2000)” theme, clear selected data using eraser, and zoom to full extent.

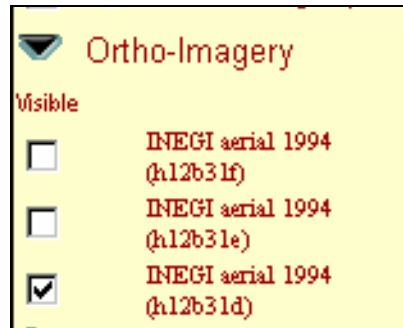
----- EXERCISE #4 -----

- 1.) Zoom into Nogales, Ariz.
- 2.) Turn on "Streams in Ambos Nogales" under hydrography.
- 3.) Turn on flood plains (Local) from Santa Cruz County.
- 4.) Zoom into the Nogales Ariz. *colonia* "Casa de Anza":

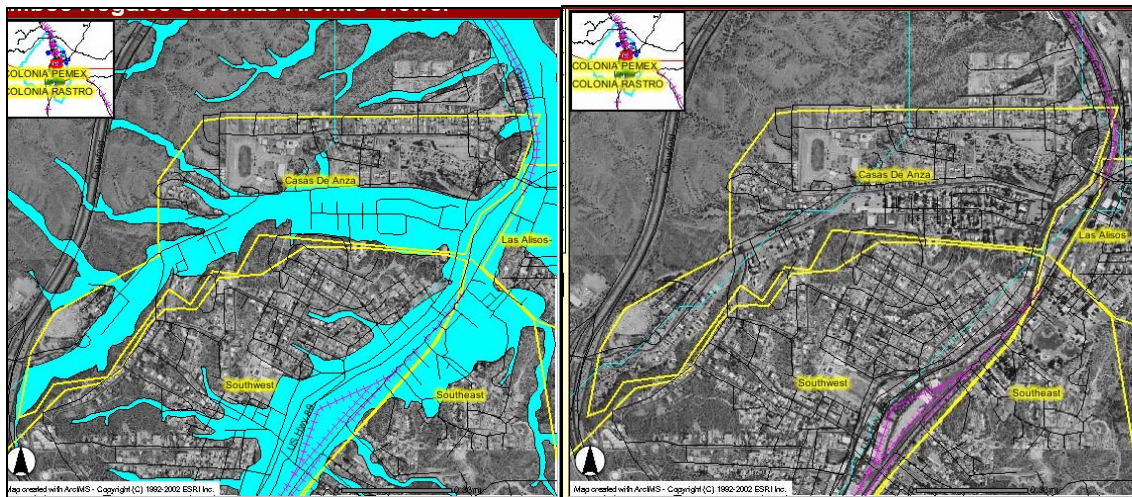




Notice the large extent of flood plain within this *colonia*.

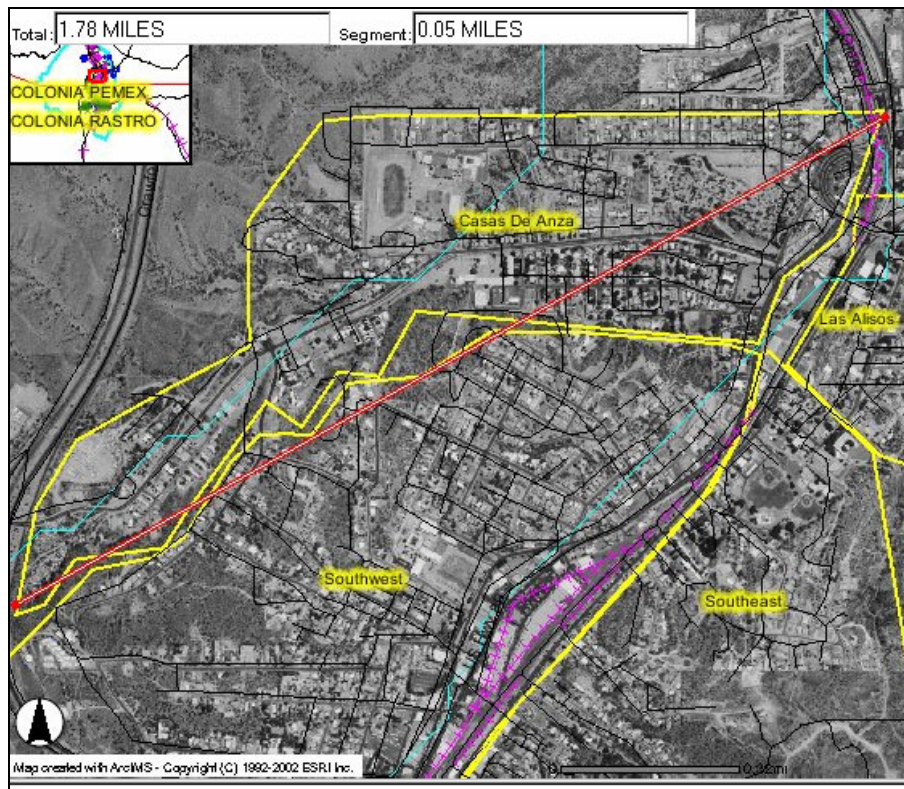
- 5.) Turn on the third DOQQ (INEGI aerial 1994 (h12b31d) from INEGI and “Refresh Map”:



- 6.) Turn flood plains off and then back on again to show how many houses this affects:




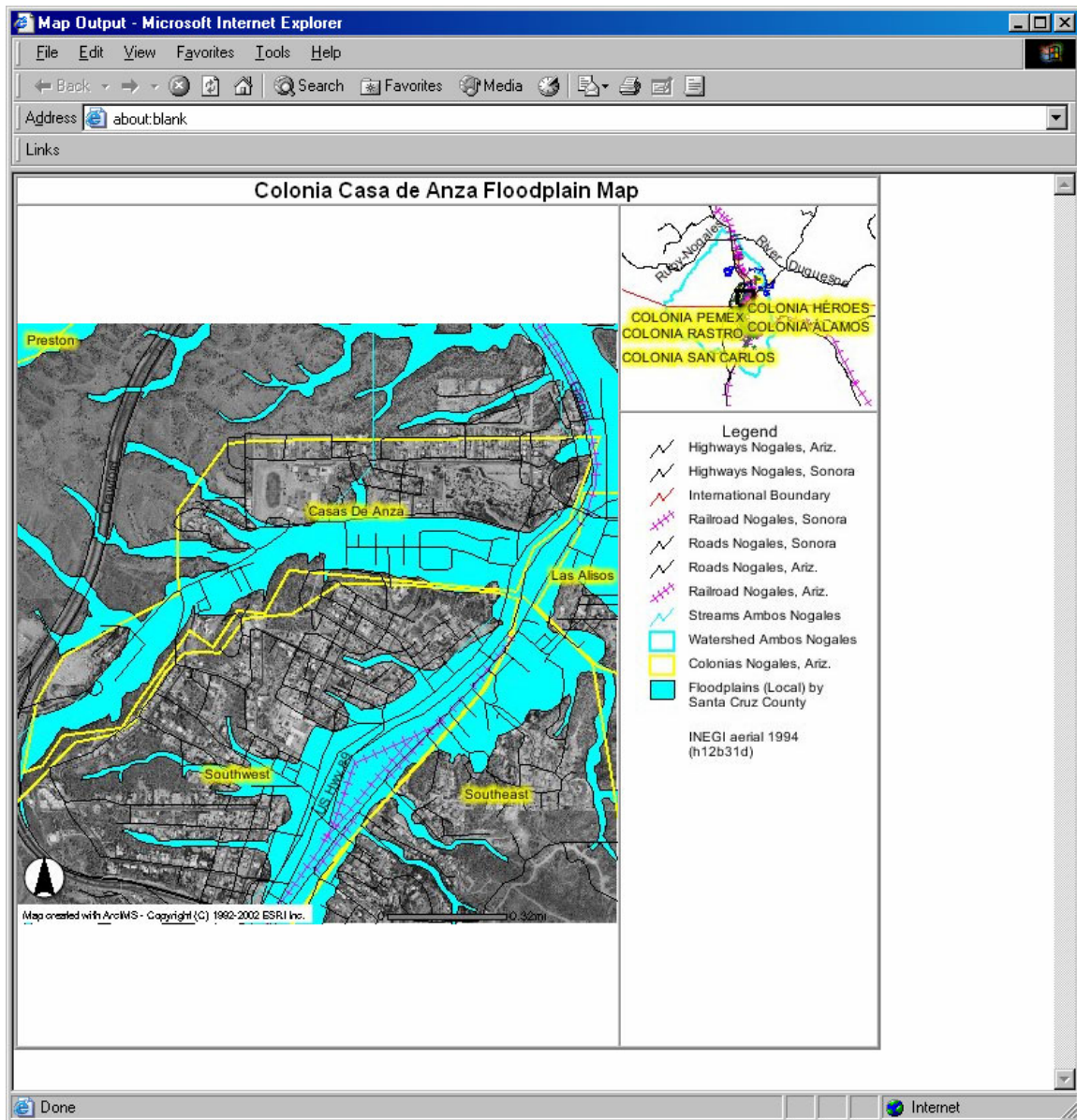
- 7.) Pick up “Set Units” Tool  (notice “Display Units” is set to miles) and then using the “Measure” Tool  measure diagonally across the *colonia* (SW--> NE); it should come out about a 1.78-mi segment:



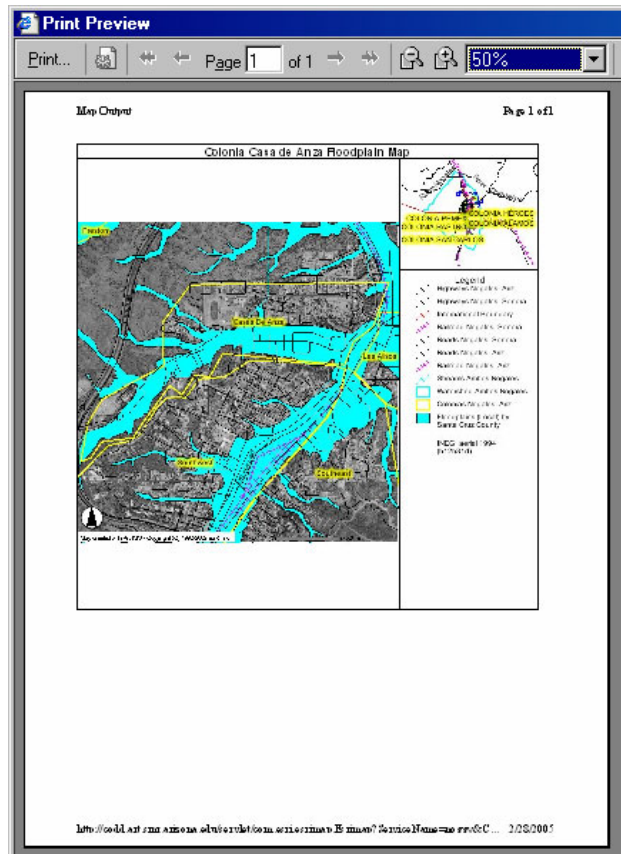
8.) Clear with the eraser tool.

9.) This information can be mapped out and printed from your computer. Turn the

Santa Cruz flood plains back on. Using the “Print” tool , change title to "Colonia Casa de Anza Floodplain Map" and push the “Create Print Page” button.



10.) Then hit Print preview, and you can send to the printer from there.



Notice the scale bar and north arrow, along with legend, map inset, and date of creation.

- 11.) Close window, close project, close Web site.

APPENDIX B: Metadata.

1975 Urban Extent of Ambos Nogales

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: 1975 Urban Extent of Ambos Nogales

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2005

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: Landsat imagery describing the Nogales, AZ and Nogales, Sonora area was acquired from 06/23/1975 at the Arizona Regional Image Archive, (<http://aria.arizona.edu>), an on-line interdisciplinary resource system for digital image and map data for the Sonoran desert region, including the U.S. Southwest and northern Mexico. The urban extent of the twin cities are was extracted from the satellite image.

Purpose: Image processing and subsequent temporal remote sensing analysis was done to quantify urban growth stemming from human settlement.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 06/23/1975

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -111.054874

East_Bounding_Coordinate: -110.727911

North_Bounding_Coordinate: 31.594747

South_Bounding_Coordinate: 31.365887

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Land Use

Theme_Keyword: Urban

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Arizona

Place_Keyword: Sonora

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: lthough the satellite data were all acquired from the Landsat system, different sensors were accessed through the years, which may lead to some discrepancy in analysis. The Landsat 1 satellite acquired the MSS imagery for the 1975 year at a 79-meter resolution. Therefore, we were limited by pixel size. Other error that could have been introduced includes error due to rubbersheeting algorithm applied to the dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Title: Landsat 5 MSS

Geospatial_Data_Presentation_Form: remote-sensing image

Other_Citation_Details: 79 m. resolution

Online_Linkage: <http://aria.arizona.edu>

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 06/23/1975

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: Geometric distortions were corrected by establishing a relationship between the satellite image and a Digital Orthophoto Quarter Quad (DOQQ) of the corresponding regions. Once these ground control points (GCP's) were established, the image is then converted, or rubbersheeted to the new coordinate system through a nearest neighbor resampling regime using a 3rd order polynomial, through a process called rectification. Identification of features by remote sensing involves computer software with the ability to identify pixels based upon their numerical properties and analyze them for statistical estimates. Using clustering methods to assign each pixel in an image to spectral classes, of which it has no foreknowledge, is called unsupervised classification. These procedures were applied to determine the location of the spectral classes into which the pixels are assigned. The analyst, who confirms these classes with information from ground maps, aerial photos, and ground visits, then identifies the output classes. Estimates of urban sprawl have been quantified by means of digitizing the urban extent area from the processed image.

Process_Date: Unknown

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 13

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 12

Planar_Coordinate_Information:

Planar_Distance_Units: meters

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: 1975

Entity_Type_Definition: Polygon used to portray urban extent in 1975

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: ID

Attribute:

Attribute_Label: GRIDCODE

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied, as to any other matter whatsoever, including, without limitation, the condition of the product or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully on computers at the USGS, no warranty, expressed or implied, is made by the USGS regarding the use of these data on any other system, nor does the fact of distribution constitute or imply any such warranty.

In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by USGS.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719

Country: USA

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998

Metadata_Time_Convention: local time

Metadata_Access_Constraints: none

Metadata_Use_Constraints: none

Metadata_Extensions:

Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>

Profile_Name: ESRI Metadata Profile

1983 Urban Extent of Ambos Nogales

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: 1983 Urban Extent of Ambos Nogales

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2005

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: Landsat imagery describing the Nogales, AZ and Nogales, Sonora area was acquired from 04/14/1983 at the Arizona Regional Image Archive, (<http://aria.arizona.edu>), an on-line interdisciplinary resource system for digital image and map data for the Sonoran desert region, including the U.S. Southwest and northern Mexico. The urban extent of the twin cities are was extracted from the satellite image.

Purpose: Image processing and subsequent temporal remote sensing analysis was done to quantify urban growth stemming from human settlement.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -111.054874

East_Bounding_Coordinate: -110.727911

North_Bounding_Coordinate: 31.594747

South_Bounding_Coordinate: 31.365887

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Land Use

Theme_Keyword: Urban

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Arizona

Place_Keyword: Sonora

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: Although the satellite data were all acquired from the Landsat system, different sensors were accessed through the years, which may lead to some discrepancy in analysis. Landsat 5 TM sensor acquired that MSS data in 1985 at a 30-m resolution. Therefore, we were limited by pixel size. Other error that could have been introduced includes error due to rubbersheeting algorithm applied to the dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Title: Landsat 5 TM

Geospatial_Data_Presentation_Form: remote-sensing image

Other_Citation_Details: 30 m. resolution

Online_Linkage: <http://aria.arizona.edu>

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 04/14/1983

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: Geometric distortions were corrected by establishing a relationship between the satellite image and a Digital Orthophoto Quarter Quad (DOQQ) of the corresponding regions. Once these ground control points (GCP's) were established, the image is then converted, or rubbersheeted to the new coordinate system through a nearest neighbor resampling regime using a 3rd order polynomial, through a process called rectification. Identification of features by remote sensing involves computer software with the ability to identify pixels based upon their numerical properties and analyze them for statistical estimates. Using clustering methods to assign each pixel in an image to spectral classes, of which it has no foreknowledge, is called unsupervised classification. These procedures were applied to determine the location of the spectral classes into which the pixels are assigned. The analyst, who confirms these classes with information from ground maps, aerial photos, and ground visits, then identifies the output classes. Estimates of urban sprawl have been quantified by means of digitizing the urban extent area from the processed image.

Process_Date: Unknown

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 16

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 12

Planar_Coordinate_Information:

Planar_Distance_Units: meters

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: 1983

Entity_Type_Definition: Polygon used to portray urban extent in 1983

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: ID

Attribute:

Attribute_Label: GRIDCODE

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

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In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by USGS.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355
City: Tucson
State_or_Province: AZ
Postal_Code: 85719
Country: USA
Contact_Voice_Telephone: 520 670 5510
Contact_Facsimile_Telephone: 520 670 5571
Contact_Electronic_Mail_Address: lnorman@usgs.gov
Hours_of_Service: 9-5
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

1995 Urban Extent of Ambos Nogales

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: 1995 Urban Extent of Ambos Nogales

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2005

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: Landsat imagery describing the Nogales, AZ and Nogales, Sonora area was acquired from 05/11/1996 at the Arizona Regional Image Archive, (<http://aria.arizona.edu>), an on-line interdisciplinary resource system for digital image and map data for the Sonoran desert region, including the U.S. Southwest and northern Mexico. The urban extent of the twin cities are was extracted from the satellite image.

Purpose: Image processing and subsequent temporal remote sensing analysis was done to quantify urban growth stemming from human settlement.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 05/11/1996

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -111.054874

East_Bounding_Coordinate: -110.727911

North_Bounding_Coordinate: 31.594747

South_Bounding_Coordinate: 31.365887

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Land Use

Theme_Keyword: Urban

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Arizona

Place_Keyword: Sonora

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: Although the satellite data were all acquired from the Landsat system, different sensors were accessed through the years, which may lead to some discrepancy in analysis. Landsat 5 TM sensor acquired that MSS data in 1995 at a 30-m resolution. Therefore, we were limited by pixel size. Other error that could have been introduced includes error due to rubbersheeting algorithm applied to the dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Title: Landsat 5 TM

Geospatial_Data_Presentation_Form: remote-sensing image

Other_Citation_Details: 30 m. resolution

Online_Linkage: <http://aria.arizona.edu>

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 05/11/1996

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: Geometric distortions were corrected by establishing a relationship between the satellite image and a Digital Orthophoto Quarter Quad (DOQQ) of the corresponding regions. Once these ground control points (GCP's) were established, the image is then converted, or rubbersheeted to the new coordinate system through a nearest neighbor resampling regime using a 3rd order polynomial, through a process called rectification. Identification of features by remote sensing involves computer software with the ability to identify pixels based upon their numerical properties and analyze them for statistical estimates. Using clustering methods to assign each pixel in an image to spectral classes, of which it has no foreknowledge, is called unsupervised classification. These procedures were applied to determine the location of the spectral classes into which the pixels are assigned. The analyst, who confirms these classes with information from ground maps, aerial photos, and ground visits, then identifies the output classes. Estimates of urban sprawl have been quantified by means of digitizing the urban extent area from the processed image.

Process_Date: Unknown

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 24

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 12

Planar_Coordinate_Information:

Planar_Distance_Units: meters

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: 1995

Entity_Type_Definition: Polygon used to portray urban extent in 1995

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: ID

Attribute:

Attribute_Label: GRIDCODE

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

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In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by USGS.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355
City: Tucson
State_or_Province: AZ
Postal_Code: 85719
Country: USA
Contact_Voice_Telephone: 520 670 5510
Contact_Facsimile_Telephone: 520 670 5571
Contact_Electronic_Mail_Address: lnorman@usgs.gov
Hours_of_Service: 9-5
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

2002 Urban Extent of Ambos Nogales

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: 2002 Urban Extent of Ambos Nogales

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: http://crossborder.arizona.edu/colonias/n_project.htm

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2005

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: Landsat imagery describing the Nogales, AZ and Nogales, Sonora area was acquired from 06/21/2002 at the Arizona Regional Image Archive, (<http://aria.arizona.edu>), an on-line interdisciplinary resource system for digital image and map data for the Sonoran desert region, including the U.S. Southwest and northern Mexico. The urban extent of the twin cities are was extracted from the satellite image.

Purpose: Image processing and subsequent temporal remote sensing analysis was done to quantify urban growth stemming from human settlement.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 06/21/2002

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -111.054874

East_Bounding_Coordinate: -110.727911

North_Bounding_Coordinate: 31.594747

South_Bounding_Coordinate: 31.365887

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Land Use

Theme_Keyword: Urban

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Arizona

Place_Keyword: Sonora

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: Although the satellite data were all acquired from the Landsat system, different sensors were accessed through the years, which may lead to some discrepancy in analysis. Landsat 7 Enhanced Thematic Mapper Plus (ETM+) sensor acquired that data in 2002 at a 30-m resolution. Therefore, we were limited by pixel size. Other error that could have been introduced includes error due to rubbersheeting algorithm applied to the dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Title: Landsat 7 Enhanced Thematic Mapper Plus (ETM+)

Geospatial_Data_Presentation_Form: remote-sensing image

Other_Citation_Details: 30 m. resolution

Online_Linkage: <http://aria.arizona.edu>

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 06/21/2002

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: Geometric distortions were corrected by establishing a relationship between the satellite image and a Digital Orthophoto Quarter Quad (DOQQ) of the corresponding regions. Once these ground control points (GCP's) were established, the image is then converted, or rubbersheeted to the new coordinate system through a nearest neighbor resampling regime using a 3rd order polynomial, through a process called rectification. Identification of features by remote sensing involves computer software with the ability to identify pixels based upon their numerical properties and analyze them for statistical estimates. Using clustering methods to assign each pixel in an image to spectral classes, of which it has no foreknowledge, is called unsupervised classification. These procedures were applied to determine the location of the spectral classes into which the pixels are assigned. The analyst, who confirms these classes with information from ground maps, aerial photos, and ground visits, then identifies the output classes. Estimates of urban sprawl have been quantified by means of digitizing the urban extent area from the processed image.

Process_Date: Unknown

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 24

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 12

Planar_Coordinate_Information:

Planar_Distance_Units: meters

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: 2002

Entity_Type_Definition: Polygon used to portray urban extent in 1995

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: ID

Attribute:

Attribute_Label: GRIDCODE

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

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Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355
City: Tucson
State_or_Province: AZ
Postal_Code: 85719
Country: USA
Contact_Voice_Telephone: 520 670 5510
Contact_Facsimile_Telephone: 520 670 5571
Contact_Electronic_Mail_Address: lnorman@usgs.gov
Hours_of_Service: 9-5
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

Waterlines for Nogales, Arizona**Identification_Information:****Citation:****Citation_Information:**

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: Waterlines for Nogales, Arizona

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>**Larger_Work_Citation:****Citation_Information:**

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2004

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>**Description:**

Abstract: Eduardo Delgado & Gerardo Calza (City of Nogales, Arizona-Department of Public Works) provided this information describing City of Nogales operated water lines for this project.

Purpose: This data was used in colonia designation where local officials used sewer lines and water lines in collaboration with street maps to pinpoint known colonia boundaries.

Time_Period_of_Content:**Time_Period_Information:****Single_Date/Time:**

Calendar_Date: unknown

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:**Bounding_Coordinates:**

West_Bounding_Coordinate: -110.977030

East_Bounding_Coordinate: -110.891321

North_Bounding_Coordinate: 31.390743

South_Bounding_Coordinate: 31.332258

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Water lines

Theme_Keyword: Infrastructure

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Arizona

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: While the locations of pipe are thought to be most accurate according to the City of Nogales, Department of Public Works, there were no legal boundaries used to define the dataset.

Completeness_Report: Only those water lines that were identified by the City of Nogales, Department of Public Works were incorporated in this dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator: Nogales Department of Public Works

Publication_Date: Unpublished Material

Title: Waterlines for the City of Nogales, Arizona

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: The water lines, as delivered by the City of Nogales Department of Public Works shapefile format, were taken into this dataset.

Process_Date: 12/03
 Spatial_Data_Organization_Information:
 Direct_Spatial_Reference_Method: Vector
 Point_and_Vector_Object_Information:
 SDTS_Terms_Description:
 SDTS_Point_and_Vector_Object_Type: String
 Point_and_Vector_Object_Count: 422
 Spatial_Reference_Information:
 Horizontal_Coordinate_System_Definition:
 Planar:
 Grid_Coordinate_System:
 Grid_Coordinate_System_Name: Universal Transverse Mercator
 Universal_Transverse_Mercator:
 UTM_Zone_Number: 12
 Transverse_Mercator:
 Scale_Factor_at_Central_Meridian: 0.999600
 Longitude_of_Central_Meridian: -111.000000
 Latitude_of_Projection_Origin: 0.000000
 False_Easting: 500000.000000
 False_Northing: 0.000000
 Planar_Coordinate_Information:
 Planar_Coordinate_Encoding_Method: coordinate pair
 Coordinate_Representation:
 Abscissa_Resolution: 0.000016
 Ordinate_Resolution: 0.000016
 Planar_Distance_Units: meters
 Geodetic_Model:
 Horizontal_Datum_Name: North American Datum of 1983
 Ellipsoid_Name: Geodetic Reference System 80
 Semi-major_Axis: 6378137.000000
 Denominator_of_Flattening_Ratio: 298.257222
 Entity_and_Attribute_Information:
 Detailed_Description:
 Entity_Type:
 Entity_Type_Label: uswtr27
 Attribute:
 Attribute_Label: FID
 Attribute_Definition: Internal feature number.
 Attribute_Definition_Source: ESRI
 Attribute_Domain_Values:
 Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.
 Attribute:
 Attribute_Label: Shape
 Attribute_Definition: Feature geometry.
 Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: FNODE_

Attribute:

Attribute_Label: TNODE_

Attribute:

Attribute_Label: LPOLY_

Attribute:

Attribute_Label: RPOLY_

Attribute:

Attribute_Label: LENGTH

Attribute:

Attribute_Label: USWTR_

Attribute_Definition: ID#

Attribute:

Attribute_Label: USWTR_ID

Attribute_Definition: ID#

Attribute:

Attribute_Label: SIZE

Attribute_Definition: Size of Pipe

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied, as to any other matter whatsoever, including, without limitation, the condition of the product or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully on computers at the USGS, no warranty, expressed or implied, is made by the USGS regarding the use of these data on any other system, nor does the fact of distribution constitute or imply any such warranty.

In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by USGS.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719

Country: USA

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998

Metadata_Time_Convention: local time

Metadata_Access_Constraints: none

Metadata_Use_Constraints: none

Metadata_Extensions:

Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>

Profile_Name: ESRI Metadata Profile

Waterlines in Nogales, Sonora**Identification_Information:****Citation:****Citation_Information:**

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: Waterlines in Nogales, Sonora

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>**Larger_Work_Citation:****Citation_Information:**

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2005

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>**Description:**

Abstract: This data was supplied by The University of Arizona, Udall Center for Studies in Public Policy, courtesy of Robert Varady. Hector Rocha and Cesar Espinoza Rodriguez (La Comisión de Agua Potable y Alcantarillado del Estado de Sonora (COAPAES) in Nogales, Sonora) reviewed the content of this file, finding it satisfactory.

Purpose: This data served to be instrumental in colonia designation: when local officials used automated sewer lines and water lines in collaboration with street maps to pinpoint known colonia boundaries.

Time_Period_of_Content:**Time_Period_Information:**

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:**Bounding_Coordinates:**

West_Bounding_Coordinate: -110.966148

East_Bounding_Coordinate: -110.917536

North_Bounding_Coordinate: 31.332489

South_Bounding_Coordinate: 31.278996

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Water lines

Theme_Keyword: Infrastructure

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Sonora

Place_Keyword: Mexico

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Cross_Reference:

Citation_Information:

Series_Information:

Publication_Information:

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: While the water lines are thought to be most accurate according to the people who were involved in their review, the locations were not field-checked.

Completeness_Report: Only those water lines that were identified by both the participants were incorporated in this dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator: Varady, R.G., and Mack, M.D.,

Publication_Date: 1995

Title: Transboundary water resources and public health in the US-Mexico region

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:
 Series_Name: Journal of Environmental Health
 Issue_Identification: v. 57, n. 8,p. 8-14.
 Publication_Information:
 Other_Citation_Details: modified from
 Source_Time_Period_of_Content:
 Time_Period_Information:
 Single_Date/Time:
 Source_Currentness_Reference: ground condition
 Process_Step:
 Process_Description: The original shapefile format were reprojected. In addition,
 local infrastructure authorities at COAPAES were asked to review the localities of pipes
 in their community.
 Process_Date: 12/03
 Spatial_Data_Organization_Information:
 Direct_Spatial_Reference_Method: Vector
 Point_and_Vector_Object_Information:
 SDTS_Terms_Description:
 SDTS_Point_and_Vector_Object_Type: String
 Point_and_Vector_Object_Count: 1041
 Spatial_Reference_Information:
 Horizontal_Coordinate_System_Definition:
 Planar:
 Grid_Coordinate_System:
 Grid_Coordinate_System_Name: Universal Transverse Mercator
 Universal_Transverse_Mercator:
 UTM_Zone_Number: 12
 Transverse_Mercator:
 Scale_Factor_at_Central_Meridian: 0.999600
 Longitude_of_Central_Meridian: -111.000000
 Latitude_of_Projection_Origin: 0.000000
 False_Easting: 500000.000000
 False_Northing: 0.000000
 Planar_Coordinate_Information:
 Planar_Coordinate_Encoding_Method: coordinate pair
 Coordinate_Representation:
 Abscissa_Resolution: 0.000016
 Ordinate_Resolution: 0.000016
 Planar_Distance_Units: meters
 Geodetic_Model:
 Horizontal_Datum_Name: North American Datum of 1983
 Ellipsoid_Name: Geodetic Reference System 80
 Semi-major_Axis: 6378137.000000
 Denominator_of_Flattening_Ratio: 298.257222
 Entity_and_Attribute_Information:
 Detailed_Description:

Entity_Type:

Entity_Type_Label: mexwtr

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: FNODE_

Attribute:

Attribute_Label: TNODE_

Attribute:

Attribute_Label: LPOLY_

Attribute:

Attribute_Label: RPOLY_

Attribute:

Attribute_Label: LENGTH

Attribute:

Attribute_Label: MEXWTR_

Attribute_Definition: ID #

Attribute:

Attribute_Label: MEXWTR_ID

Attribute_Definition: ID #

Attribute:

Attribute_Label: SIZE

Attribute_Definition: Size of Pipe

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

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for use lies entirely with the user. Although these data have been processed successfully on computers at the USGS, no warranty, expressed or implied, is made by the USGS regarding the use of these data on any other system, nor does the fact of distribution constitute or imply any such warranty.

In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by USGS.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719

Country: USA

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998

Metadata_Time_Convention: local time

Metadata_Access_Constraints: none

Metadata_Use_Constraints: none

Metadata_Extensions:

Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>

Profile_Name: ESRI Metadata Profile

Sewerlines of Nogales, Arizona

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: Sewer lines of Nogales, Arizona

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2005

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: Eduardo Delgado & Gerardo Calza (City of Nogales, Arizona-Department of Public Works) provided this information describing City of Nogales operated sewer lines for this project.

Purpose: This data was used in colonia designation where local officials used sewer lines and water lines in collaboration with street maps to pinpoint known colonia boundaries.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -110.967544

East_Bounding_Coordinate: -110.911347

North_Bounding_Coordinate: 31.385527

South_Bounding_Coordinate: 31.332125

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Sewer lines

Theme_Keyword: Infrastructure

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Arizona

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: While the locations of pipe are thought to be most accurate according to the City of Nogales, Department of Public Works, there were no legal boundaries used to define the dataset.

Completeness_Report: Only those sewer lines that were identified by the City of Nogales, Department of Public Works were incorporated in this dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator: Nogales Department of Public Works

Publication_Date: Unpublished Material

Title: Sewerlines for the City of Nogales, Arizona

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: The sewer lines, as delivered by the City of Nogales Department of Public Works shapefile format, were adapted to this dataset.

Process_Date: 12/03
 Process_Step:
 Process_Description: Metadata imported.
 Source_Used_Citation_Abbreviation:
 C:\DOCUME~1\Inorman\LOCALS~1\Temp\xml936.tmp
 Spatial_Data_Organization_Information:
 Direct_Spatial_Reference_Method: Vector
 Point_and_Vector_Object_Information:
 SDTS_Terms_Description:
 SDTS_Point_and_Vector_Object_Type: String
 Point_and_Vector_Object_Count: 352
 Spatial_Reference_Information:
 Horizontal_Coordinate_System_Definition:
 Planar:
 Grid_Coordinate_System:
 Grid_Coordinate_System_Name: Universal Transverse Mercator
 Universal_Transverse_Mercator:
 UTM_Zone_Number: 12
 Transverse_Mercator:
 Scale_Factor_at_Central_Meridian: 0.999600
 Longitude_of_Central_Meridian: -111.000000
 Latitude_of_Projection_Origin: 0.000000
 False_Easting: 500000.000000
 False_Northing: 0.000000
 Planar_Coordinate_Information:
 Planar_Coordinate_Encoding_Method: coordinate pair
 Coordinate_Representation:
 Abscissa_Resolution: 0.000016
 Ordinate_Resolution: 0.000016
 Planar_Distance_Units: meters
 Geodetic_Model:
 Horizontal_Datum_Name: North American Datum of 1983
 Ellipsoid_Name: Geodetic Reference System 80
 Semi-major_Axis: 6378137.000000
 Denominator_of_Flattening_Ratio: 298.257222
 Entity_and_Attribute_Information:
 Detailed_Description:
 Entity_Type:
 Entity_Type_Label: ussew27
 Attribute:
 Attribute_Label: FID
 Attribute_Definition: Internal feature number.
 Attribute_Definition_Source: ESRI
 Attribute_Domain_Values:
 Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: FNODE_

Attribute:

Attribute_Label: TNODE_

Attribute:

Attribute_Label: LPOLY_

Attribute:

Attribute_Label: RPOLY_

Attribute:

Attribute_Label: LENGTH

Attribute:

Attribute_Label: USSEW_

Attribute_Definition: ID#

Attribute:

Attribute_Label: USSEW_ID

Attribute_Definition: ID#

Attribute:

Attribute_Label: SIZE

Attribute_Definition: Size of Pipe

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

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Standard_Order_Process:

Digital_Form:
 Digital_Transfer_Information:
 Transfer_Size: 0.016
Metadata_Reference_Information:
 Metadata_Date: 20060208
 Metadata_Contact:
 Contact_Information:
 Contact_Person_Primary:
 Contact_Person: Laura M. Norman
 Contact_Organization: U.S. Geological Survey
 Contact_Position: Cartographer, GIS Specialist
 Contact_Address:
 Address_Type: mailing address
 Address: 520 N Park Ave, Ste #355
 City: Tucson
 State_or_Province: AZ
 Postal_Code: 85719
 Country: USA
 Contact_Voice_Telephone: 520 670 5510
 Contact_Facsimile_Telephone: 520 670 5571
 Contact_Electronic_Mail_Address: lmbrady@usgs.gov
 Hours_of_Service: 9-5
 Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
 Metadata_Standard_Version: FGDC-STD-001-1998
 Metadata_Time_Convention: local time
 Metadata_Access_Constraints: none
 Metadata_Use_Constraints: none
 Metadata_Extensions:
 Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
 Profile_Name: ESRI Metadata Profile

Sewerlines for Nogales, Sonora

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: Sewerlines for Nogales, Sonora

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: 2005

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: This data was supplied by The University of Arizona, Udall Center for Studies in Public Policy, courtesy of Robert Varady. Hector Rocha and Cesar Espinoza Rodriguez (La Comisión de Agua Potable y Alcantarillado del Estado de Sonora (COAPAES) in Nogales, Sonora) reviewed the content of this file, finding it satisfactory.

Purpose: This data served to be instrumental in colonia designation: when local officials used automated sewer lines and water lines in collaboration with street maps to pinpoint known colonia boundaries.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: 2004

Status:

Progress: Complete

Maintenance_and_Update_Frequency: None planned

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -110.965152

East_Bounding_Coordinate: -110.918330

North_Bounding_Coordinate: 31.332654

South_Bounding_Coordinate: 31.273280

Keywords:

Theme:

Theme_Keyword_Thesaurus: none

Theme_Keyword: Water lines

Theme_Keyword: Infrastructure

Place:

Place_Keyword_Thesaurus: none

Place_Keyword: Nogales

Place_Keyword: Sonora

Place_Keyword: Mexico

Access_Constraints: none

Use_Constraints: none

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)

Service Pack 2; ESRI ArcCatalog 9.0.0.535

Cross_Reference:

Citation_Information:

Series_Information:

Publication_Information:

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: While the water lines are thought to be most accurate according to the people who were involved in their review, the locations were not field-checked.

Completeness_Report: Only those water lines that were identified by both the participants were incorporated in this dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator: Varady, R.G., and Mack, M.D.,

Publication_Date: 1995

Title: Transboundary water resources and public health in the US-Mexico region

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:
 Series_Name: Journal of Environmental Health
 Issue_Identification: v. 57, n. 8,p. 8-14.
 Publication_Information:
 Other_Citation_Details: modified from
 Source_Time_Period_of_Content:
 Time_Period_Information:
 Single_Date/Time:
 Source_Currentness_Reference: ground condition
 Process_Step:
 Process_Description: The original shapefile format were reprojected. In addition,
 local infrastructure authorities at COAPAES were asked to review the localities of pipes
 in their community.
 Process_Date: 12/03
 Spatial_Data_Organization_Information:
 Direct_Spatial_Reference_Method: Vector
 Point_and_Vector_Object_Information:
 SDTS_Terms_Description:
 SDTS_Point_and_Vector_Object_Type: String
 Point_and_Vector_Object_Count: 1128
 Spatial_Reference_Information:
 Horizontal_Coordinate_System_Definition:
 Planar:
 Grid_Coordinate_System:
 Grid_Coordinate_System_Name: Universal Transverse Mercator
 Universal_Transverse_Mercator:
 UTM_Zone_Number: 12
 Transverse_Mercator:
 Scale_Factor_at_Central_Meridian: 0.999600
 Longitude_of_Central_Meridian: -111.000000
 Latitude_of_Projection_Origin: 0.000000
 False_Easting: 500000.000000
 False_Northing: 0.000000
 Planar_Coordinate_Information:
 Planar_Coordinate_Encoding_Method: coordinate pair
 Coordinate_Representation:
 Abscissa_Resolution: 0.000016
 Ordinate_Resolution: 0.000016
 Planar_Distance_Units: meters
 Geodetic_Model:
 Horizontal_Datum_Name: North American Datum of 1983
 Ellipsoid_Name: Geodetic Reference System 80
 Semi-major_Axis: 6378137.000000
 Denominator_of_Flattening_Ratio: 298.257222
 Entity_and_Attribute_Information:
 Detailed_Description:

Entity_Type:

Entity_Type_Label: mexswr

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: FNODE_

Attribute:

Attribute_Label: TNODE_

Attribute:

Attribute_Label: LPOLY_

Attribute:

Attribute_Label: LENGTH

Attribute:

Attribute_Label: SIZE

Attribute_Definition: Size of Pipe

Attribute:

Attribute_Label: RPOLY_

Attribute:

Attribute_Label: MEXSEW_

Attribute:

Attribute_Label: MEXSEW_ID

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

The U.S. Geological Survey (USGS) provides these geographic data "as is." The USGS makes no guarantee or warranty concerning the accuracy of information contained in the geographic data. The USGS further makes no warranties, either expressed or implied, as to any other matter whatsoever, including, without limitation, the condition of the product or its fitness for any particular purpose. The burden for determining fitness for use lies entirely with the user. Although these data have been processed successfully on computers at the USGS, no warranty, expressed or implied, is made by the USGS

regarding the use of these data on any other system, nor does the fact of distribution constitute or imply any such warranty.

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Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719

Country: USA

Contact_Voice_Telephone: 520 670 5510

Contact_Facsimile_Telephone: 520 670 5571

Contact_Electronic_Mail_Address: lnorman@usgs.gov

Hours_of_Service: 9-5

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998

Metadata_Time_Convention: local time

Metadata_Access_Constraints: none

Metadata_Use_Constraints: none

Metadata_Extensions:

Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>

Profile_Name: ESRI Metadata Profile

Colonias of Nogales, Arizona

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: Nogales, Arizona Colonias

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: Unpublished Material

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-05-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: Eduardo Delgado & Gerardo Calza (City of Nogales, Arizona-Department of Public Works), Michael Alcala (Environmental Health Coordinator, Santa Cruz County Health Department & US Department of Health), Cynthia Shoemaker (Teacher, Nogales, AZ Elementary School) and Hector Bajorquez (City of Nogales, Arizona-- Housing Authority) identified the poorest neighborhoods to call "colonias" for this project. Areas already deemed colonias by Santa Cruz County were also included.

Purpose: This process was labor intensive and required a lot of time and effort on part of the analyst. The resulting datasets, however, serve to be instrumental in colonia designation. A suitability/ capability analysis (SCA) was implemented based on the housing and infrastructure suitability and/or capability of given areas to support colonias. Local officials used newly automated sewer lines and water lines in collaboration with street maps to pinpoint known colonia boundaries.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: unknown

Currentness_Reference: 2004

Status:

Progress: Complete
 Maintenance_and_Update_Frequency: None planned
 Spatial_Domain:
 Bounding_Coordinates:
 West_Bounding_Coordinate: -111.054874
 East_Bounding_Coordinate: -110.727911
 North_Bounding_Coordinate: 31.594747
 South_Bounding_Coordinate: 31.365887
 Keywords:
 Theme:
 Theme_Keyword_Thesaurus: none
 Theme_Keyword: Colonias
 Theme_Keyword: Nogales
 Place:
 Place_Keyword_Thesaurus: none
 Place_Keyword: Nogales
 Place_Keyword: Arizona
 Access_Constraints: none
 Use_Constraints: none
 Point_of_Contact:
 Contact_Information:
 Contact_Person_Primary:
 Contact_Person: Laura M. Norman
 Contact_Organization: U.S. Geological Survey
 Contact_Position: Cartographer, GIS Specialist
 Contact_Voice_Telephone: 520 670 5510
 Contact_Facsimile_Telephone: 520 670 5571
 Contact_Electronic_Mail_Address: lnorman@usgs.gov
 Hours_of_Service: 9-5
 Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)
 Service Pack 2; ESRI ArcCatalog 9.0.0.535
 Data_Quality_Information:
 Attribute_Accuracy:
 Attribute_Accuracy_Report: While the boundaries are thought to be most accurate according to the people who were involved in their deliniation, there were no legal boundaries used to define the colonias dataset.
 Completeness_Report: Only those neighborhoods that were deemed colonias by the participants were incorporated in this dataset.
 Lineage:
 Source_Information:
 Source_Citation:
 Citation_Information:
 Source_Time_Period_of_Content:
 Time_Period_Information:
 Single_Date/Time:
 Calendar_Date: unknown

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: The original colonias boundaries, as delivered by the City of Nogales Department of Public Works shapefile format, were taken into this dataset and new boundaries were added to it. Local representatives were asked to draw boundaries on hard copy print out maps describing the roads, sewer, and water infrastructure overlain on aerial photos of their community. These approximations were based upon previous knowledge and familiarity with the most impoverished and underprivileged areas known to them at that time. These polygons boundaries were then digitized and attributed.

Process_Date: 12/03

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 15

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 12

Planar_Coordinate_Information:

Planar_Distance_Units: meters

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: Colonias

Entity_Type_Definition: Colonias were defined by the Cranston-Gonzales Act of 1990 as rural communities and neighborhoods located within 150 miles of the U.S.-Mexican border. Some colonias may be entire border communities, while others are comprised of neighborhoods within incorporated communities. They lack adequate infrastructure (sewer or water lines) and/or housing.

Entity_Type_Definition_Source:

<http://www.hud.gov/groups/frmwrkcoln/whatcol.cfm>

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: NAME

Attribute_Definition: Name of Colonia

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

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In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by USGS.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719
Country: USA
Contact_Voice_Telephone: 520 670 5510
Contact_Facsimile_Telephone: 520 670 5571
Contact_Electronic_Mail_Address: lnorman@usgs.gov
Hours_of_Service: 9-5
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

Homogeneous Areas of Nogales, Sonora

Identification_Information:

Citation:

Citation_Information:

Originator: Laura M. Norman

Publication_Date: 2005

Publication_Time: Unknown

Title: Homogeneous Areas of Nogales, Sonora

Edition: 1

Geospatial_Data_Presentation_Form: vector digital data

Online_Linkage: <http://crossborder.arizona.edu/colonias/>

Larger_Work_Citation:

Citation_Information:

Originator: By Laura M. Norman, Angela Donelson, Edwin Pfeifer, and Alven H.

Lam

Publication_Date: Unpublished Material

Title: COLONIA DEVELOPMENT AND LAND USE CHANGE IN AMBOS
NOGALES, UNITED STATES - MEXICAN BORDER

Geospatial_Data_Presentation_Form: vector digital data

Series_Information:

Series_Name: Open File Report

Issue_Identification: OFR-2005-XXXX

Publication_Information:

Publication_Place: Menlo Park, CA

Publisher: USGS

Online_Linkage: <http://wgsc.wr.usgs.gov/wrgeog_pubs/>

Description:

Abstract: Alberto Suárez Barnett (Historian of the Municipality Nogales, Sonora), Teresa Leal (Coordinator, Border Links in Nogales, Sonora), Hector Rocha and Cesar Espinoza Rodriguez (La Comisión de Agua Potable y Alcantarillado del Estado de Sonora (COAPAES) in Nogales, Sonora) identify neighborhoods lacking infrastructure and adequate housing conditions in Nogales, Sonora. Those areas identified by community members of Nogales, Sonora as "Barrios Pobres" for this project, were also identified by the Urban Office of the Secretary of Infrastructure and Ecology of the Government of the State of Sonora (Secretaría de Infraestructura Urbana y Ecología (SIUE)), as neighborhoods that are either "Popular Dwellings", or "Precarious Constructions".

Purpose: This process was labor intensive and required a lot of time and effort on part of the analyst. The resulting datasets, however, serve to be instrumental in colonia designation. A suitability/ capability analysis (SCA) was implemented based on the housing and infrastructure suitability and/or capability of given areas to support colonias. Local officials used newly automated sewer lines and water lines in collaboration with street maps to pinpoint known colonia boundaries.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:
 Calendar_Date: unknown
 Currentness_Reference: 2004
 Status:
 Progress: Complete
 Maintenance_and_Update_Frequency: None planned
 Spatial_Domain:
 Bounding_Coordinates:
 West_Bounding_Coordinate: -110.965152
 East_Bounding_Coordinate: -110.918330
 North_Bounding_Coordinate: 31.332654
 South_Bounding_Coordinate: 31.273280
 Keywords:
 Theme:
 Theme_Keyword_Thesaurus: none
 Theme_Keyword: Colonias
 Theme_Keyword: Nogales
 Place:
 Place_Keyword_Thesaurus: none
 Place_Keyword: Nogales
 Place_Keyword: Sonora
 Access_Constraints: none
 Use_Constraints: none
 Point_of_Contact:
 Contact_Information:
 Contact_Person_Primary:
 Contact_Person: Laura M. Norman
 Contact_Organization: U.S. Geological Survey
 Contact_Position: Cartographer, GIS Specialist
 Contact_Voice_Telephone: 520 670 5510
 Contact_Facsimile_Telephone: 520 670 5571
 Contact_Electronic_Mail_Address: lnorman@usgs.gov
 Hours_of_Service: 9-5
 Native_Data_Set_Environment: Microsoft Windows XP Version 5.1 (Build 2600)
 Service Pack 2; ESRI ArcCatalog 9.0.0.535
 Cross_Reference:
 Citation_Information:
 Series_Information:
 Publication_Information:
 Data_Quality_Information:
 Attribute_Accuracy:
 Attribute_Accuracy_Report: While the boundaries are thought to be most accurate according to the people who were involved in their deliniation, the boundaries used to define the colonias dataset were described by the Urban Office of the Secretary of Infrastructure and Ecology of the Government of the State of Sonora (Secretaría de Infraestructura Urbana y Ecología (SIUE)).

Completeness_Report: Only those neighborhoods that were identified by both the participants and the cited reference were incorporated in this dataset.

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator: Urban Office of the Secretary of Infrastructure and Ecology of the Government of the State of Sonora (Secretaría de Infraestructura Urbana y Ecología (SIUE))

Originator: PROGRAMA MUNICIPAL DE DESARROLLO URBANO DEL CENTRO DE POBLACION NOGALES, SONORA.

Originator: DIRECCION DE DESARROLLO URBANO OBRAS PUBLICAS Y ECOLOGIA

Publication_Date: 04/2000

Title: Plan Municipal de Desarrollo 2000-2003

Geospatial_Data_Presentation_Form: AutoCAD

Series_Information:

Series_Name: Plan Municipal de Desarrollo

Publication_Information:

Publication_Place: Nogales, Sonora

Other_Citation_Details:

The H. City Hall through the Direction of Planning of the Urban Development, Public Works and Ecology, in coordination with the Government of the State of Sonorous, through the Urban Secretary of Infrastructure and Ecology, have been given to the task to bring up to date the Municipal Program of Urban Development of the Center of Population of Nogales, Sonorous, that is concurrent of the National Program of Urban Development, as well as Development 1997-2000.

Those areas identified by community members of Nogales, Sonora as "Barrios Pobres" for this project, were also identified by the Urban Office of the Secretary of Infrastructure and Ecology of the Government of the State of Sonora (Secretaría de Infraestructura Urbana y Ecología (SIUE)), as neighborhoods that are either "Popular Dwellings", or "Precarious Constructions".

Popular Dwelling homes were built by their owners, some of them a long ago and some recently, therefore, there is great variability in their construction quality. Precarious Construction homes were built mainly with discarded materials, and so the quality of construction varies a lot. Those federally subsidized areas identified by community members & as "Social Interest developments" by SIUE are considered "Barrios Pobres" in this project since they are already receiving support for housing and/or infrastructure.

Source_Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Source_Currentness_Reference: ground condition

Process_Step:

Process_Description: The original colonias boundaries, as delivered by the SIUE, in AutoCAD format, were adapted into shapefile format and translated . In addition, local representatives were asked to draw boundaries on hard copy print out maps describing

the roads, sewer, and water infrastructure overlain on aerial photos of their community. These approximations were based upon previous knowledge and familiarity with the most impoverished and underprivileged areas known to them at that time. The neighborhoods identified by community members were synchronous with those identified by SIUE and therefore, the boundaries remained the same.

Process_Date: 12/03

Spatial_Data_Organization_Information:

Direct_Spatial_Reference_Method: Vector

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type: G-polygon

Point_and_Vector_Object_Count: 37

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Planar:

Grid_Coordinate_System:

Grid_Coordinate_System_Name: Universal Transverse Mercator

Universal_Transverse_Mercator:

UTM_Zone_Number: 12

Transverse_Mercator:

Scale_Factor_at_Central_Meridian: 0.999600

Longitude_of_Central_Meridian: -111.000000

Latitude_of_Projection_Origin: 0.000000

False_Easting: 500000.000000

False_Northing: 0.000000

Planar_Coordinate_Information:

Coordinate_Representation:

Abscissa_Resolution: 0.000016

Ordinate_Resolution: 0.000016

Planar_Distance_Units: meters

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Semi-major_Axis: 6378137.000000

Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label: son_barrios

Entity_Type_Definition: Colonias were defined by the Cranston-Gonzales Act of 1990 as rural communities and neighborhoods located within 150 miles of the U.S.-Mexican border. Some colonias may be entire border communities, while others are comprised of neighborhoods within incorporated communities. They lack adequate infrastructure (sewer or water lines) and/or housing.

Entity_Type_Definition_Source:

<http://www.hud.gov/groups/frmwrkcoln/whatcol.cfm>

Attribute:

Attribute_Label: FID

Attribute_Definition: Internal feature number.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Sequential unique whole numbers that are automatically generated.

Attribute:

Attribute_Label: Shape

Attribute_Definition: Feature geometry.

Attribute_Definition_Source: ESRI

Attribute_Domain_Values:

Unrepresentable_Domain: Coordinates defining the features.

Attribute:

Attribute_Label: AREA

Attribute_Definition: Area of polygon (Square meters)

Attribute:

Attribute_Label: PERIMETER

Attribute_Definition: Perimeter of polygon (Meters)

Attribute:

Attribute_Label: CLEANER_

Attribute_Definition: ID #

Attribute:

Attribute_Label: CLEANER_ID

Attribute:

Attribute_Label: NAME

Attribute_Definition: Name of colonia existing within polygon

Attribute:

Attribute_Label: SECTOR

Attribute_Definition: Sector describing type of home (as defined by cited reference)

Attribute:

Attribute_Label: DENSITY

Attribute_Definition: Code assigned to describe # of homes per area (as defined by cited reference)

Attribute:

Attribute_Label: GOV_SUBSIZ

Attribute_Definition: Is the area subsidized by government agency (ie: INFONIVIT)?

Attribute:

Attribute_Label: ZCOLONIA__

Attribute_Definition: Areas that have substandard housing --popular or precarious (as defined by cited reference).

Attribute:

Attribute_Label: DESCRIPTIO

Attribute_Definition: Sector code defined according to housing conditions within area (as defined by cited reference).

Attribute:

Attribute_Label: RANK_DENSI

Attribute_Definition: Number assigned to density code for use in mapping graduated values.

Attribute:

Attribute_Label: ENG_DENSIT

Attribute_Definition: English translation of density code.

Attribute:

Attribute_Label: SPANISH_DE

Attribute_Definition: Spanish translation of density code.

Distribution_Information:

Distributor:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: U.S. Geological Survey

Resource_Description: Downloadable Data

Distribution_Liability:

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In no event shall the USGS have any liability whatsoever for payment of any consequential, incidental, indirect, special, or tort damages of any kind, including, but not limited to, any loss of profits arising out of use of or reliance on the geographic data or arising out of the delivery, installation, operation, or support by USGS.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Transfer_Size: 0.016

Metadata_Reference_Information:

Metadata_Date: 20060208

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Laura M. Norman

Contact_Organization: U.S. Geological Survey

Contact_Position: Cartographer, GIS Specialist

Contact_Address:

Address_Type: mailing address

Address: 520 N Park Ave, Ste #355

City: Tucson

State_or_Province: AZ

Postal_Code: 85719
Country: USA
Contact_Voice_Telephone: 520 670 5510
Contact_Facsimile_Telephone: 520 670 5571
Contact_Electronic_Mail_Address: lnorman@usgs.gov
Hours_of_Service: 9-5
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: none
Metadata_Use_Constraints: none
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

REFERENCES

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Crawford-Tilley, J.S., Acevedo, W., Foresman, T.W., and Prince, W., 1996, Developing a temporal database of urban development for the Baltimore/Washington Region, *in* ASPRS/ACSM Annual Convention and Exhibition, Baltimore, Maryland, April 22-24 [Proceedings], v. 3, p. 101-110.

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