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U.S. – Mexico Border Environmental Health Initiative

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U.S. Department of the Interior
U.S. Geological Survey

Overview

- Introduction
- US/MX Integrated Mapping Databases (2005-current)
  - Border Environmental Health Initiative
- Related Studies
  - CHIPS – Texas Colonias Database (2007)
  - Santa Cruz Watershed (2009-current)
  - US/MX Border – Mapping Instream River Habitat (2010-current)
- Conclusions

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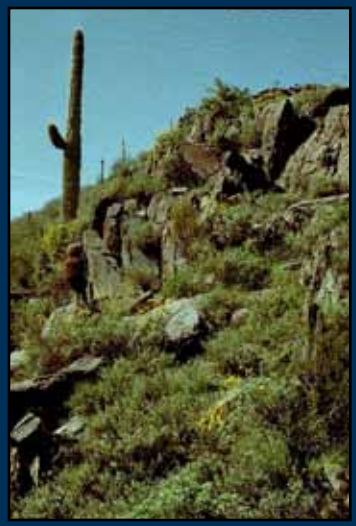
Geography

The border region of the United States and Mexico encompasses a vast and diverse array of physical settings and habitats that are unique in terms of the diversity of their water, mineral, and biological resources.

Wetlands, Riparian Areas, and Resacas

Mountains and Rangelands

Chihuahuan and Sonoran Deserts



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Demographics

- ~12 million people, extends more than 2,000 miles from the Gulf of Mexico to the Pacific Ocean.
- 90% of the border population resides in 14 paired, inter-dependent sister cities.
  - Rapid growth and immigration = unplanned development, greater energy and land demand, traffic congestion, overburdened or unavailable waste treatment and disposal facilities…
- By 2020 the population is expected to reach 19.4 million.

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Source: EPA Border 2012

- **Border Environmental Health Initiative Goal**
  - To provide science data in support of Environmental Health studies in the U.S.-Mexico Border region to enable scientists, public health officials, resource managers, and concerned citizens to make informed decisions.
- **Environmental Health**
  - The state of the physical environment as it relates to ecological condition and the well-being of the human population

Project History

- Started in 2005
- Interdisciplinary Research (USGS)
  - Included Water, Geology, Geography and Biology
- Completed in 3 phases
  - Year 1-2 - GIS Database and Web Mapping Application development
  - Year 3+ - GIS Database Update/Maintenance and Investigations
    - Topical Studies: Santa Cruz Watershed, PAHO model

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Partnerships and Collaboration

- U.S Geological Survey
- INEGI (Instituto Nacional de Estadistica, Geografia e Informatica)
- CONAGUA (Comision Nacional de Agua)
- CILA (Comision Internacional de Limites y Aguas)
- IBWC – International Boundary and Water Commission
- DOI US-MX Border Field Coordinating Committee
- EPA Border 2012
- TNRIS – Texas Natural Resource Information System
- Others

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Project Area

U.S.-Mexico border region as delineated by the FCC using watersheds and protected lands (Woodward and Durall 1996).

Specific Objectives

1. Develop a bi-national, Web Mapping Application containing natural resource data to help researchers, planners, managers, and concerned citizens make informed decisions.
2. Create a data portal allowing users to integrate the datasets into their own GIS analyses.
3. Investigate linkages between the condition of the physical environment and environmental and human health issues.

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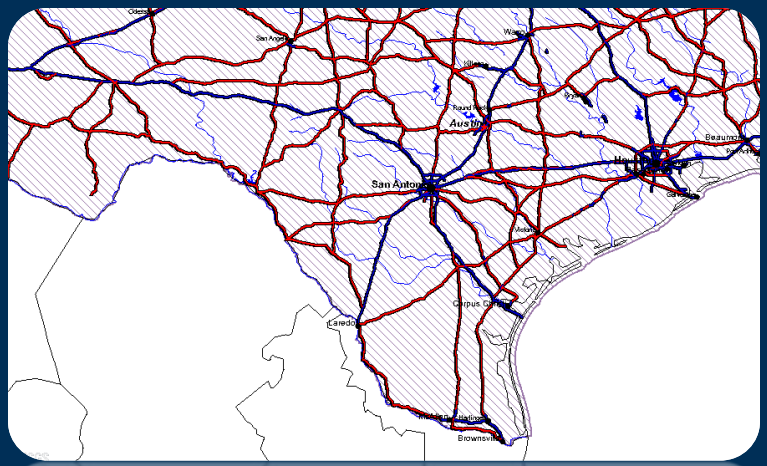
Border Data Integration Challenges



- Data availability and access
- Data discrepancies between countries
- White map syndrome

- Methods and data formats
- Translation
- Growth rate and change

tbl_CNA_parameters : Table

ID	CNA_chemical	CNA_units
1	CA	mg/L
2	MG	mg/L
3	NA	mg/L
4	K	mg/L
5	DZA_CACO3	
6	RAS	
7	PH	

OBJECTID	Chosen	Storetcode	Desc1	Desc2	Desc3	LgDesc
23	☐	00215	PH	S.U.	24HR MAX	PH, S.U., 24HR MAXIMUM VALUE
24	☐	00216	PH	S.U.	24HR MIN	PH, S.U., 24HR, MINIMUM VALUE
25	☐	00223	pH	# MEAS	24-HRS	pH, # OF MEASUREMENTS IN 24-HRS
26	☑	00400	PH		SU	PH (STANDARD UNITS)
27	☐	70310	PH	SU	BOT MUD	PH, STANDARD UNITS, BOTTOM MUDS
28	☐	89505	PH	IN LEACH	SU	PH IN LEACHATE (STANDARD UNITS)
(AutoNumber)	☐					

8	CE	dS/m
9	TEMP	degree C
10	SO4	mg/L
11	HCO3	mg/L

Record: 2 of 18

Mexico and U.S. water quality data

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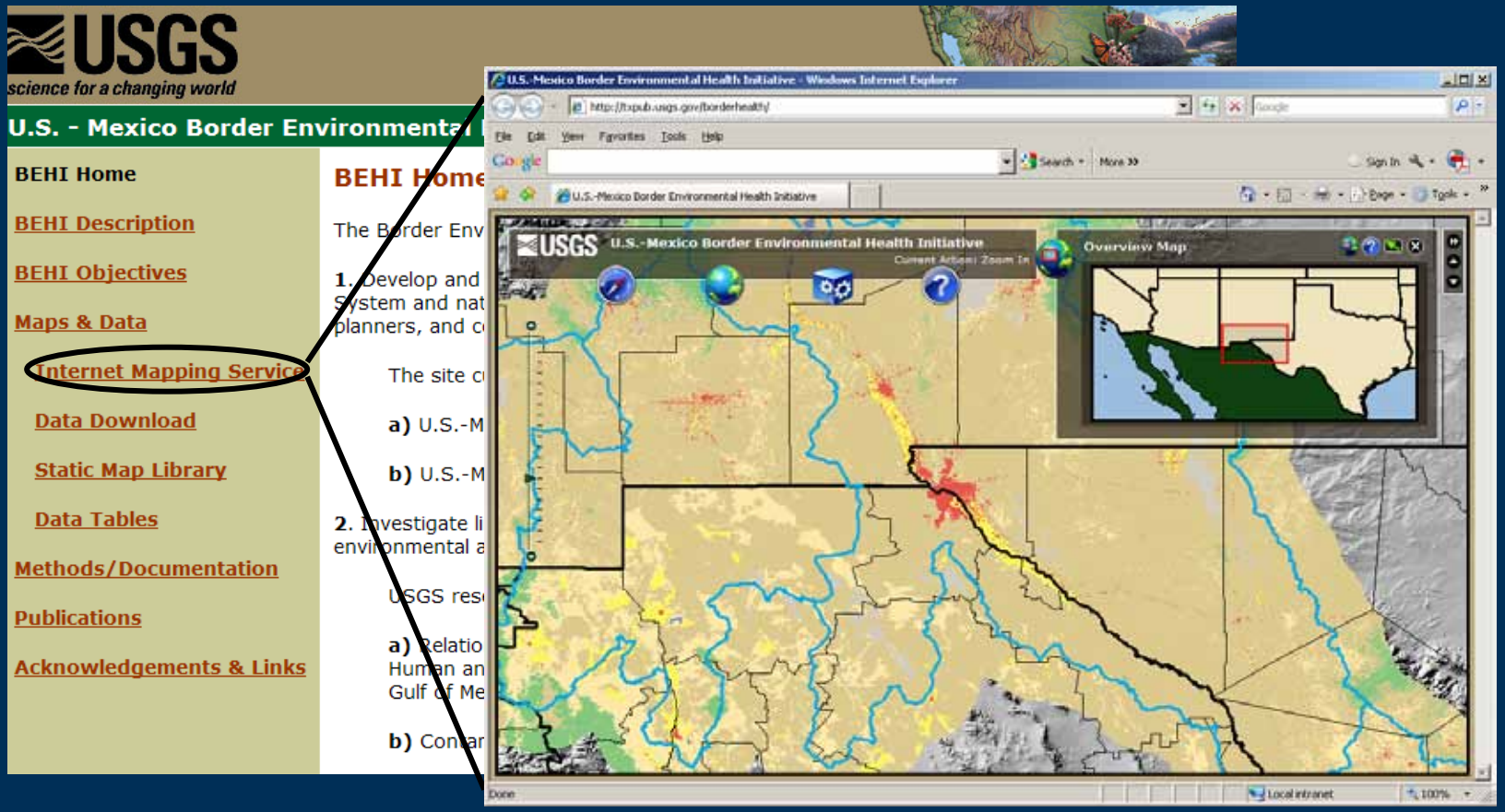
Project Website Highlights

§ http://borderhealth.cr.usgs.gov



Highlighting Bi-National Landcover and Reference Layers

Mapping Application

- Purpose: Provide visual exploration of project data layers combined with national/international base data layers (USGS NA Atlas and National Map)
- ESRI ArcGIS Server Application powered by SQL Server database
  - Enterprise database used for performance and management of application resources
- Mapping application and project databases hosted at TXWSC

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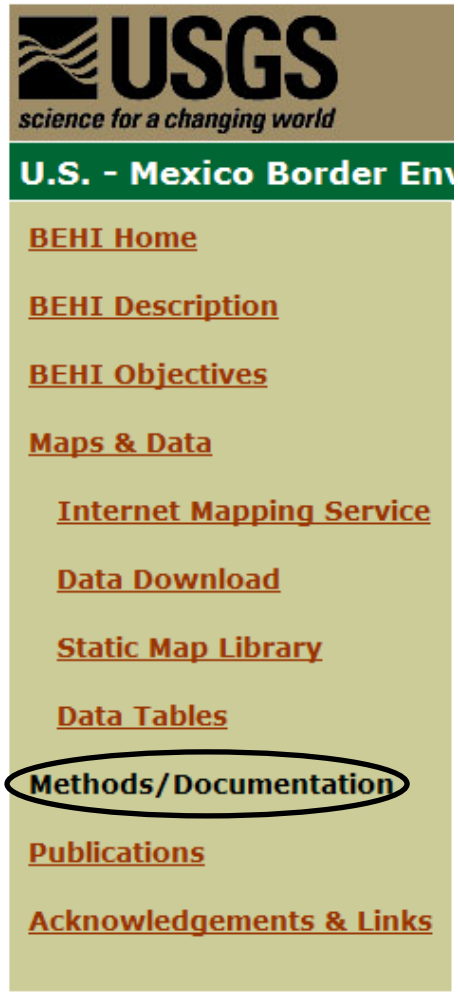
Methods and Documentation



Borderwide Binational Hydrography Methodology

US-Mexico Border Environmental Health Initiative
Internet Map Service
http://borderhealth.cr.usgs.gov
October 2005

Christy-Ann Archuleta
USGS Texas Water Science Center
Austin, Texas
carchule@usgs.gov

Background

The objective of the Border Environmental Health Initiative (BEHI) project is to provide geographic data served over the web, which will allow people to examine the ties between the physical environment and public health issues. The BEHI website is currently available on the Internet at: http://borderhealth.cr.usgs.gov. One portion of the data the BEHI is making available for the public to use is the hydrography shared between the United States and Mexico. The geographic display of hydrographic data for the United States and Mexico allows researchers to identify gaps in monitoring networks, ascertain areas of potential contamination or pollution, recognize health concerns connected to the environment, and to potentially discover many other environmental health issues. Hopefully, the identification of these issues will be an incentive for future collaborative work between the United States and Mexico.

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Data Portal and Download

U.S. - Mexico Border Environmental Health Initiative

Project News

Project Description

Project Objectives

Project Areas

Methods/Documentation

Maps & Data

Internet Mapping Service
Available Data Layers
Static Map Library
Data Tables

Publications

Acknowledgements & Links

Available Data Layers

This page allows the user to select specific themes of data to download, review the metadata and data description, and view a status map showing the data coverage. If you would like to view the data layers through the Internet Map Service, click here.

Select Categories

- [x] Places(Names)
- [ ] Structures
- [ ] Boundaries
- [ ] Transportation
- [ ] Weather/Climate
- [ ] Hydrography
- [ ] Hydrogeology
- [ ] Contaminants
- [ ] Geology
- [ ] Census
- [ ] Infectious Disease/Health Inventory
- [ ] Orthoimagery
- [ ] Land Cover
- [ ] Elevation

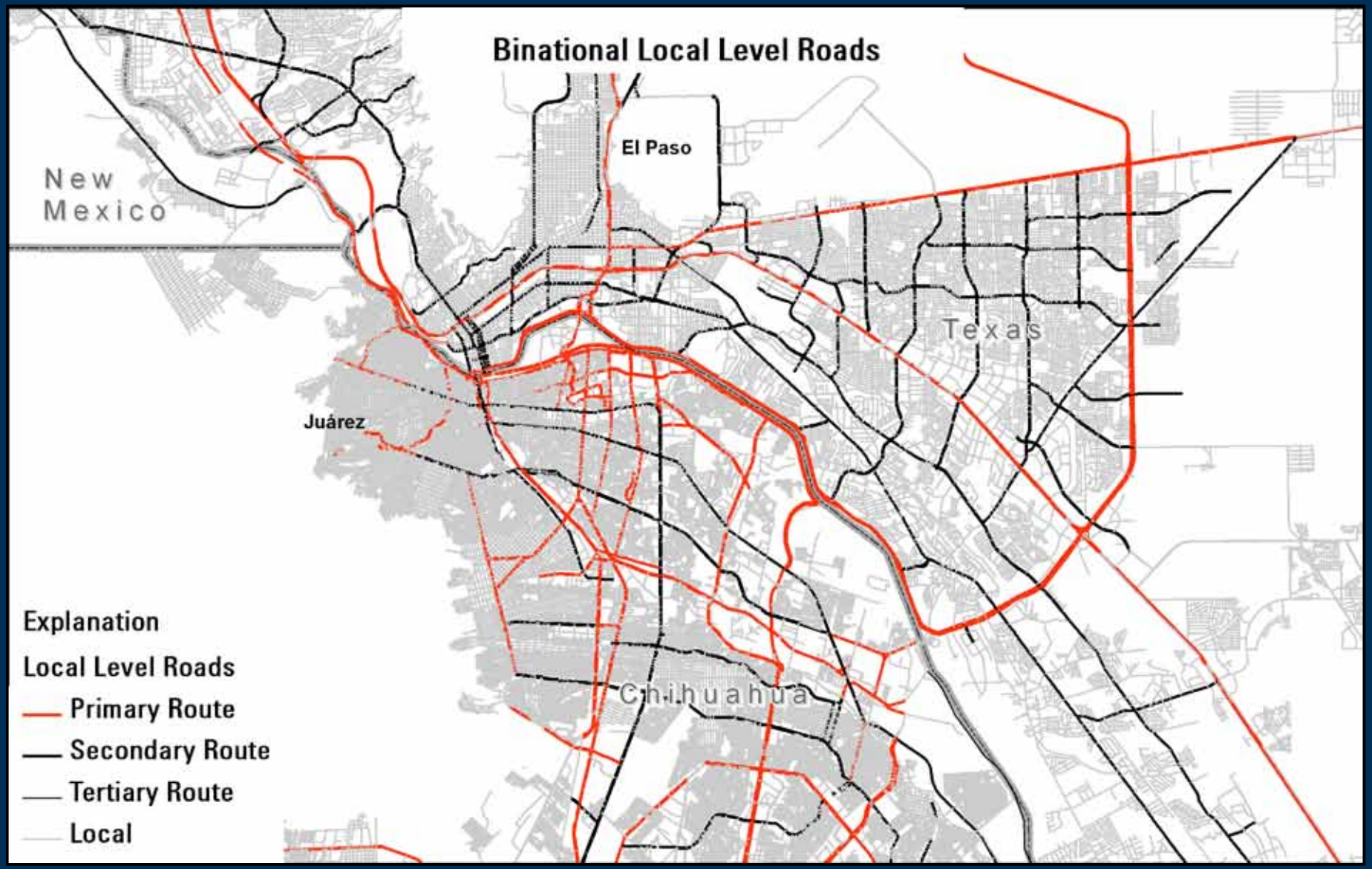
Check All | Clear All

Details of Selected Layers (It may be necessary to scroll down to view all data)

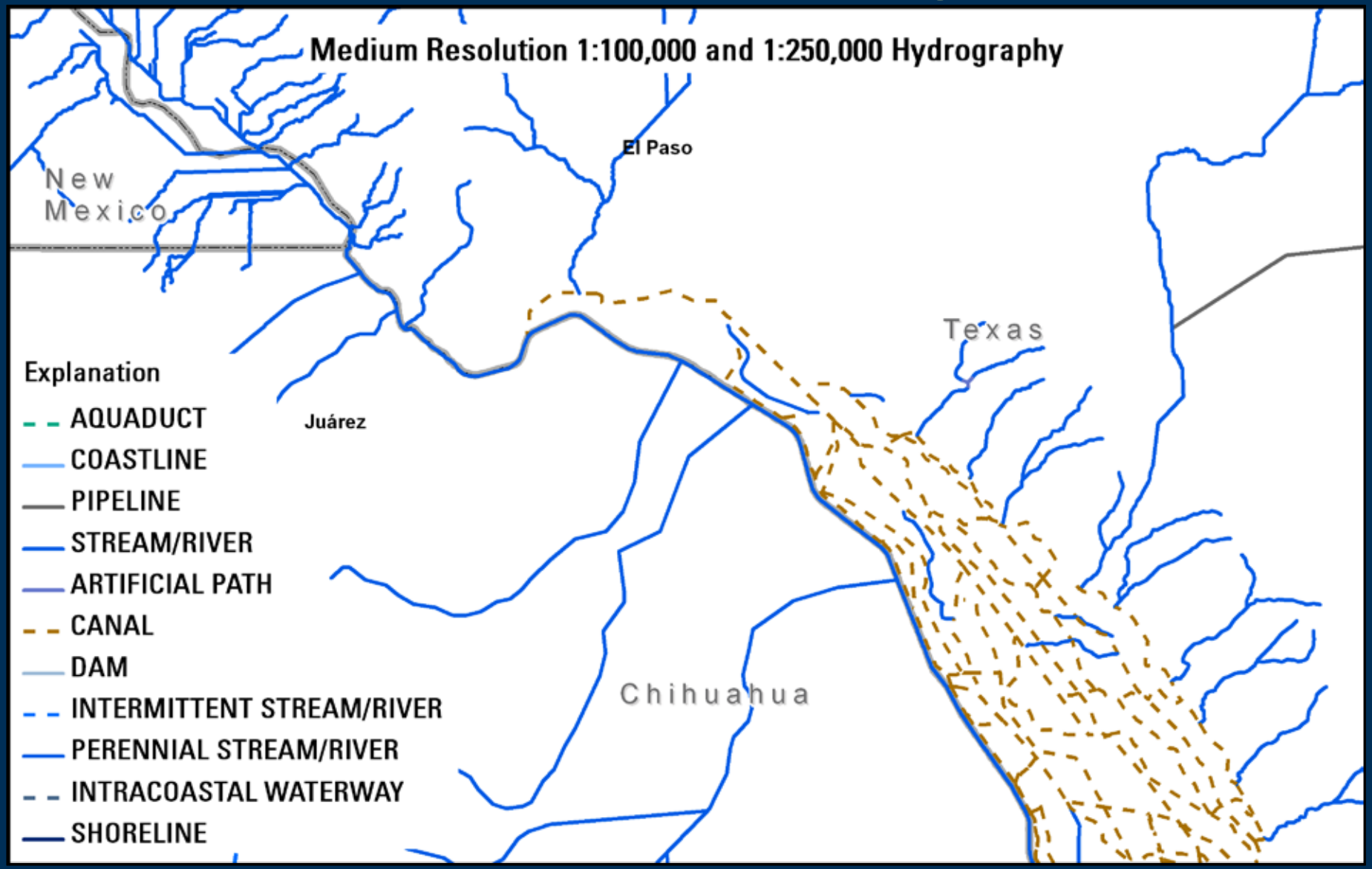
Places (Names) Layers

Layer Name	Description	Data Sources	Downloads
Major Cities: Binational	This feature class contains only major cities and city pairs in the US Mexico Border Region as defined by the Border Environmental Health Initiative Study Area. Sources included the National Atlas and Mexico Instituto Nacional de Estadistica, Geografia, e Informática (INEGI).	USGS, INEGI	Data Metadata Status Map
Cities: Binational	This dataset contains points for cities within the Border Environmental Health Initiative project area. City points are divided into three size categories and contain names.	USGS, INEGI	Data Metadata Status Map not Available
Urban Area Extents: Binational	This dataset contains urban area data for the U.S. and Mexico. For the U.S., the extent of the Texas data is the entire state, while the extent for California, Airzona, and New Mexico is restricted to the Border Environmental Health Initiative (BEHI) study area. The extent of the Mexico data is also restricted to the BEHI study area. Data for California, Arizona, and New Mexico were obtained from the U.S. Census in 2006. The Texas data were obtained from the Texas Natural Resources Information System (TNRIS) in 2006. The Mexico data were obtained from Instituto Nacional de	TNRIS, U.S. Census Bureau, INEGI	Data Metadata Status Map

Multi-Scale Transportation

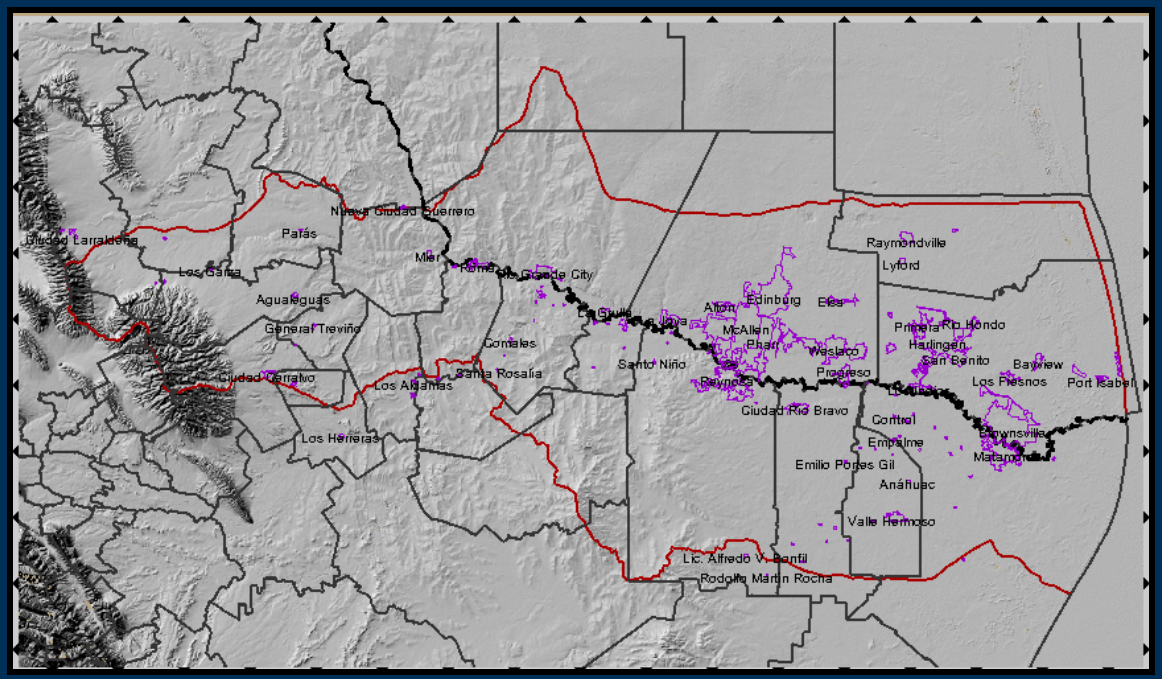


Multi-Resolution Hydrography



Anthropogenic - Boundaries

- Boundaries – Country, State, County, Census, Zip codes, 1990 and 2000 Census Demographic Data and Critical Infrastructure – Hospitals, Schools.



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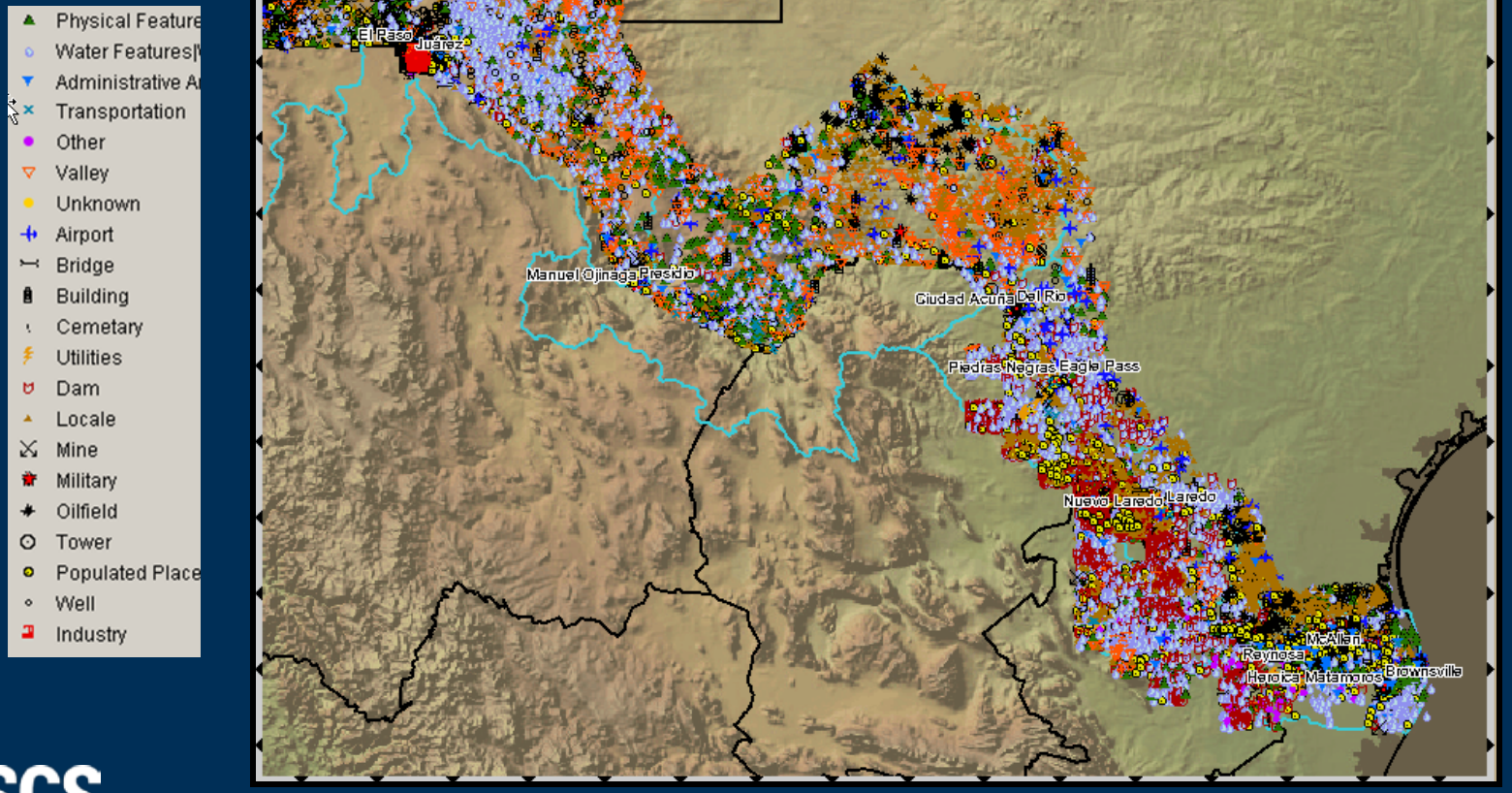
Anthropogenic – Geographic Names

- Official, certified places names for US and Mexico



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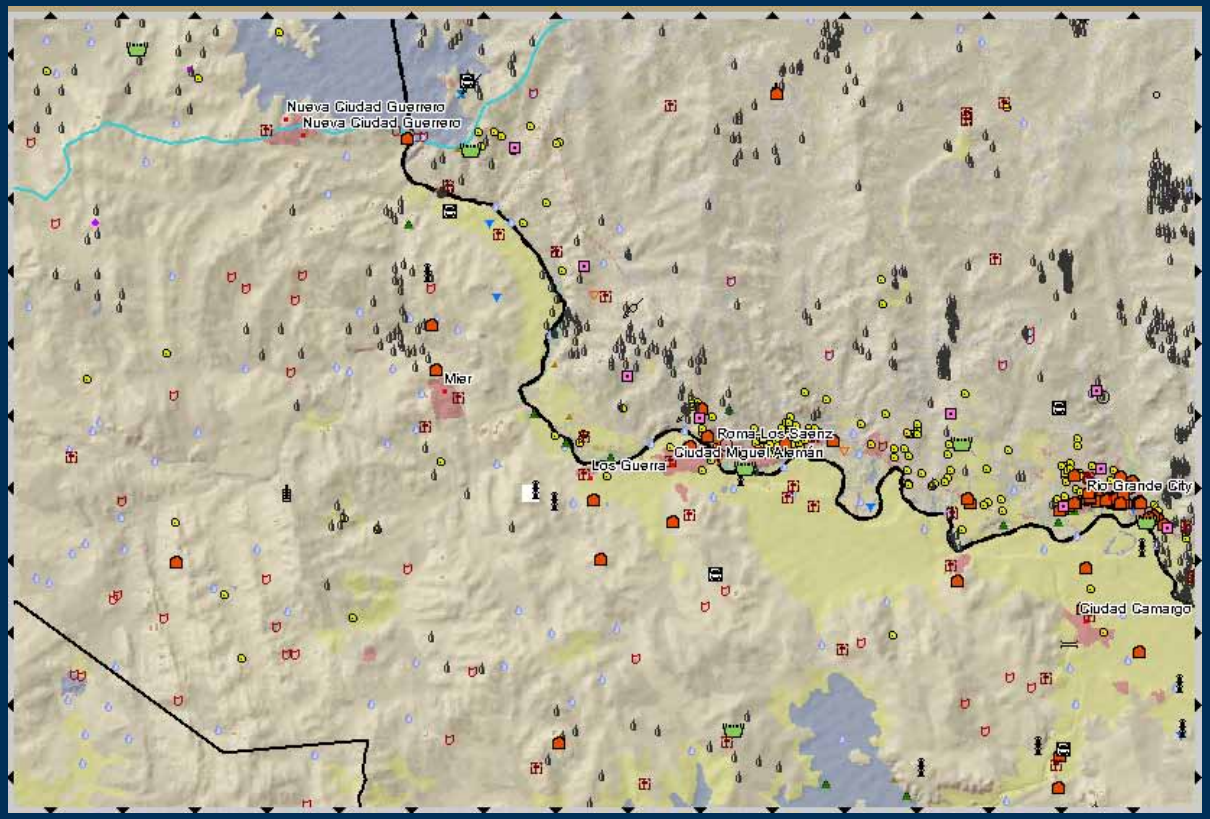
Sources:

Antropogenic – Potential Sources of Contamination (PSOCs)

- Infrastructure and facilities that risk to human and environmental health (water quality focus)



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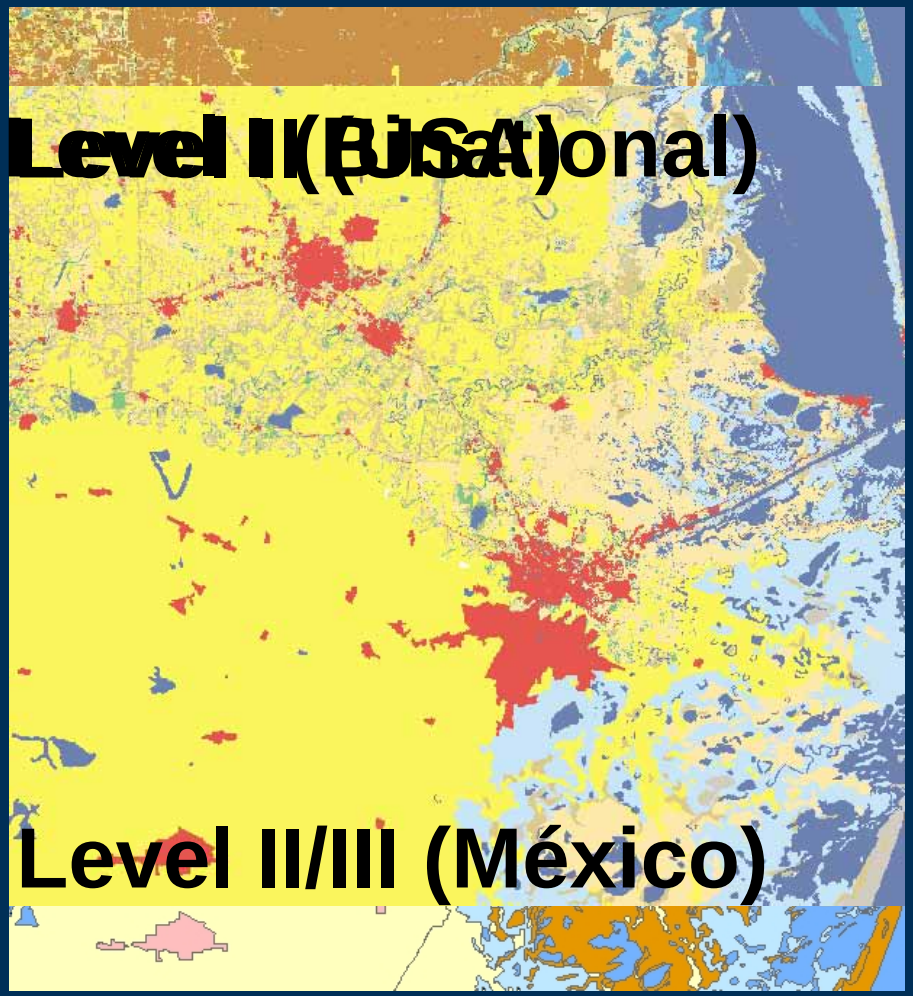
Sources:

Binational land-cover

Integration based on reclassification to Modified Anderson Level I



Example of difference between Levels II and I

Level II	**Level I**
Urban, high intensity	Urban
Urban, medium intensity	
Urban, low intensity	

specific ⟶ general

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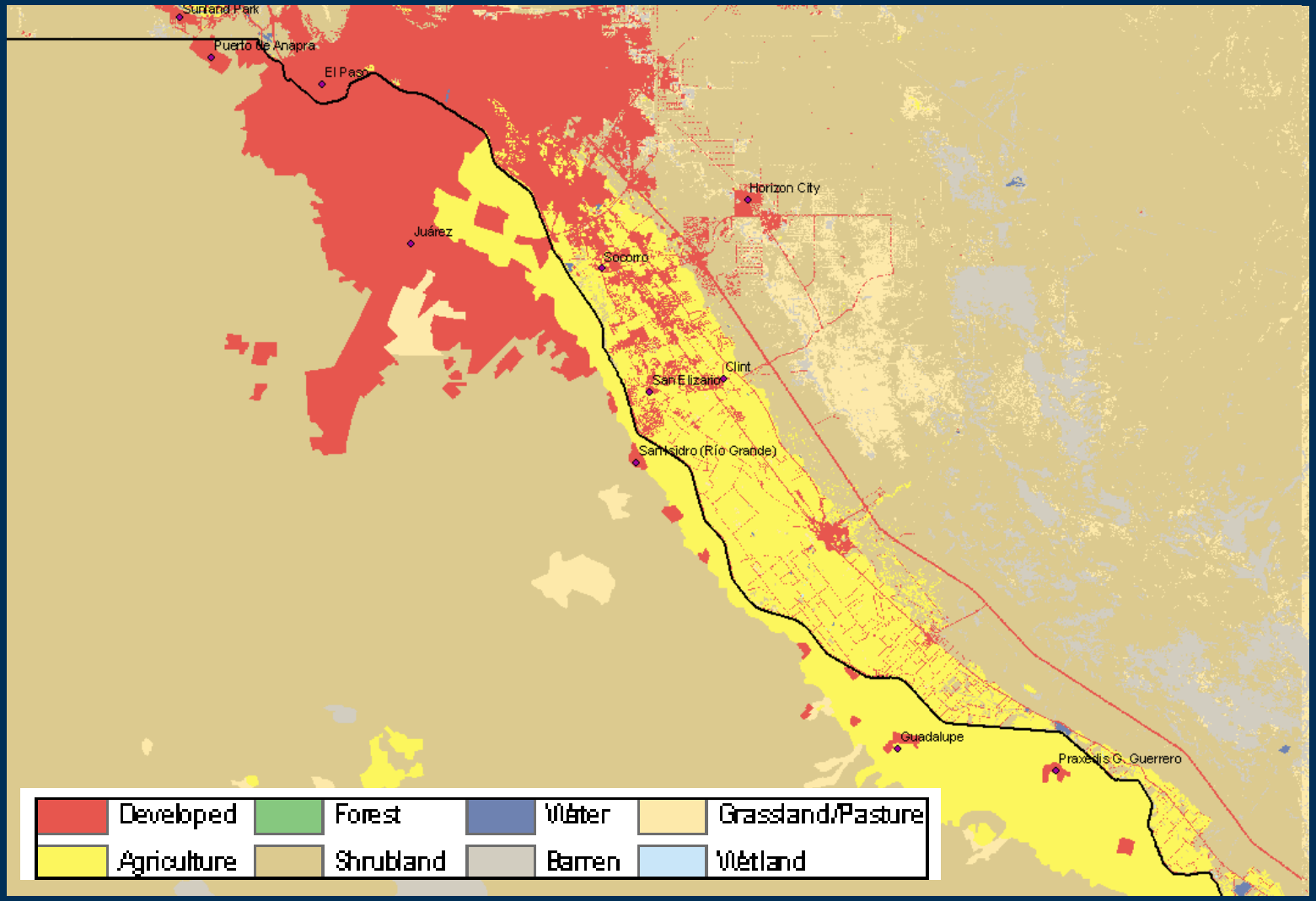
LULC Change - El Paso/Juarez Area



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Additional information

- GIS data available in multiple formats (KML, shapefile, geodatabase)
- Metadata!
- Publications (Fact Sheets, Journal Articles, Proceedings)
- Static Map Library
- Acknowledgements and Links

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Related Studies

U.S. Department of the Interior
U.S. Geological Survey

CHIPS – Monitoring Colonias along US/MX Border in Texas

- Colonia Health, Infrastructure and Platting Status tool

- What is a “colonia“?
  - Residential area along the Texas-Mexico border that lack some of the most basic living necessities, such as potable water and sewer systems, electricity, paved roads, and safe and sanitary housing

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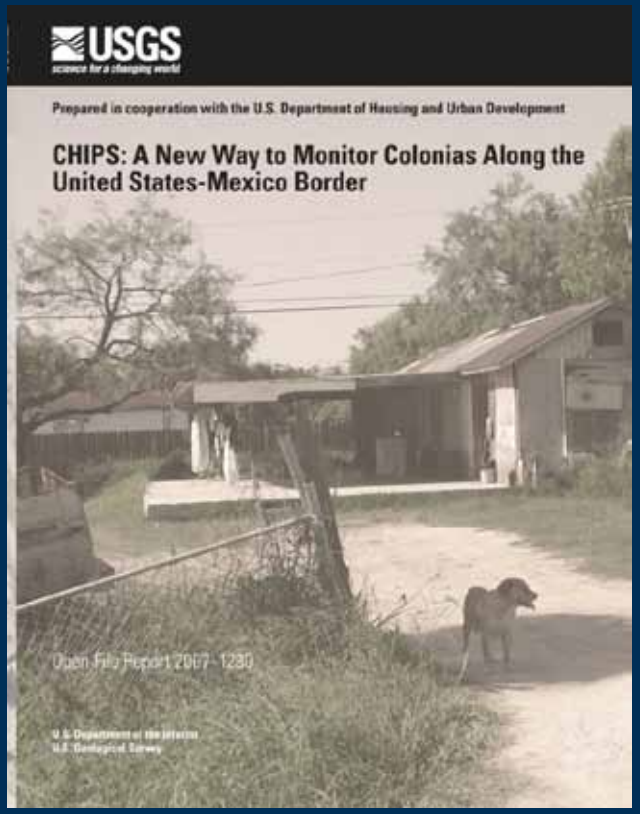
CHIPS – Monitoring Colonias along US/MX Border in Texas

- US HUD, TX Atty General Office, TWDB
- Relational database built to monitor progress, set infrastructure priorities, measure quality-of-life indicators.
- Available on BEHI site



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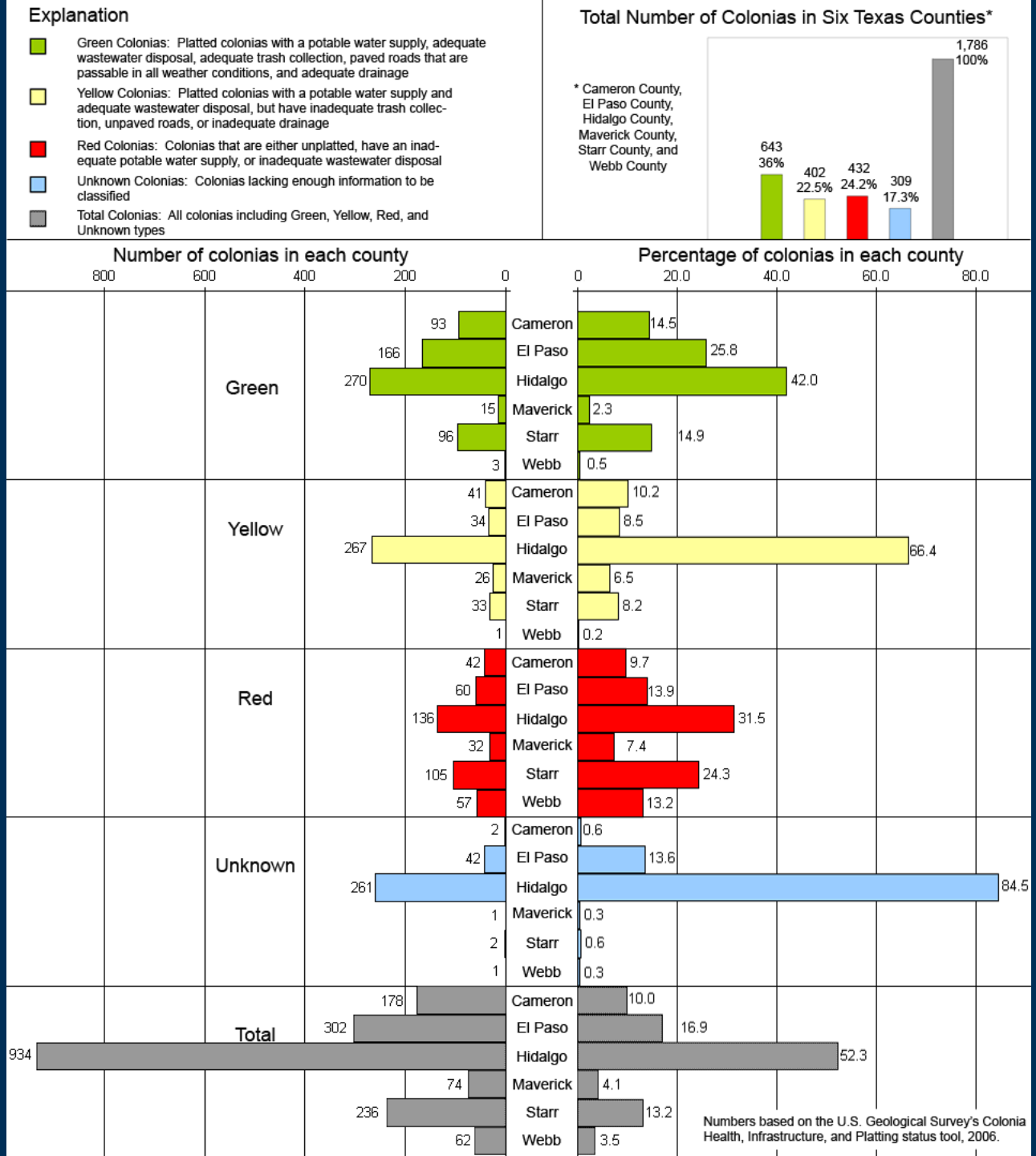
http://pubs.usgs.gov/of/2007/1230/

Colonia Health risk: Green Yellow Red



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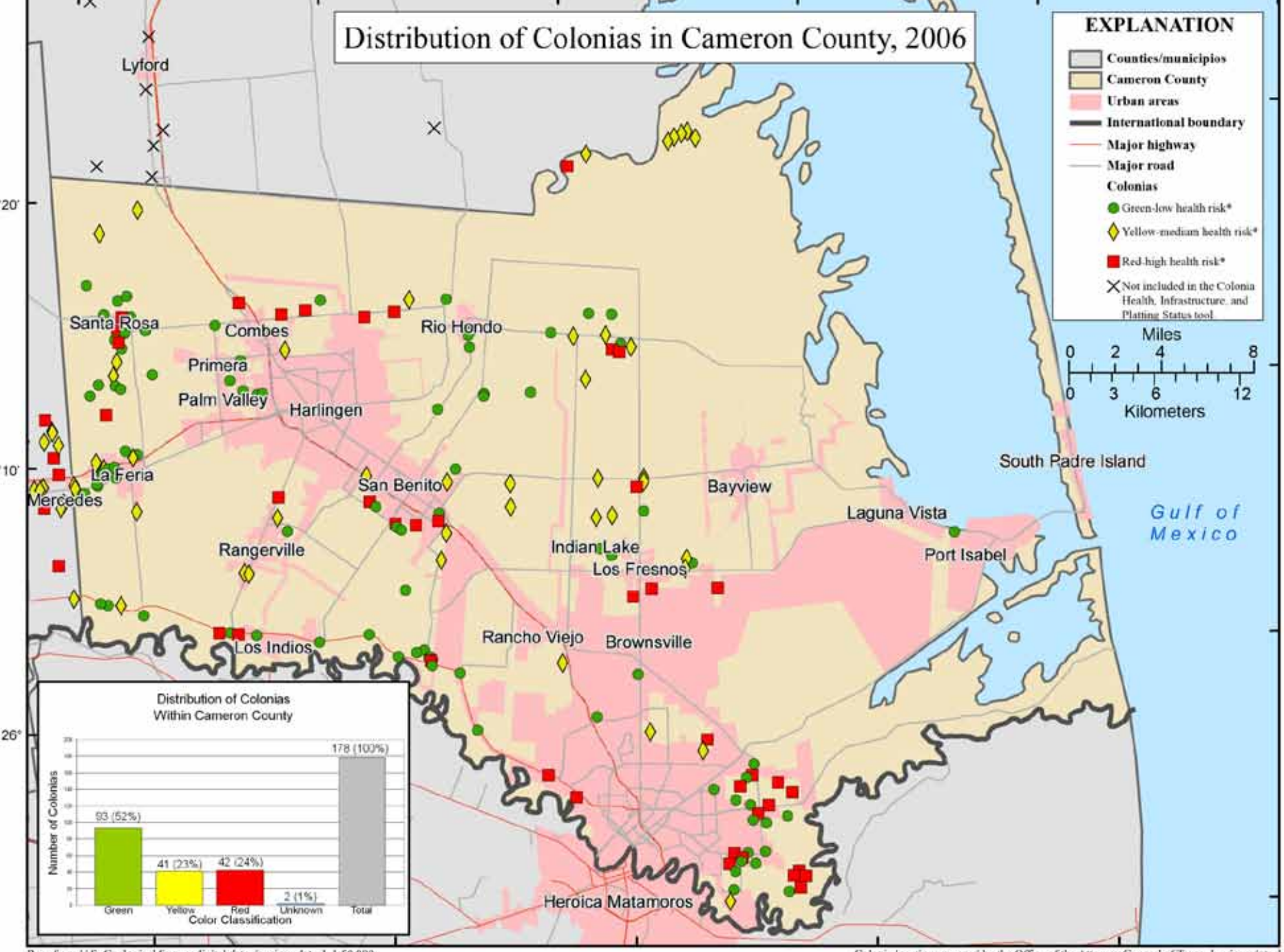
Distribution of Colonias in Cameron County, 2006



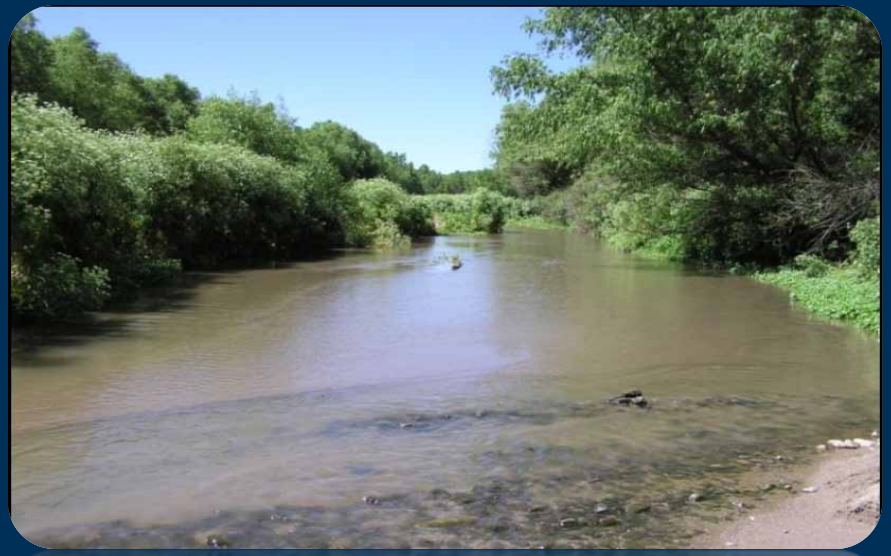
Base from U.S. Geological Survey digital data, [various dates], 1:50,000
Albers Equal-Area Conic Projection

Colonia locations mapped by the Office of the Attorney General of Texas, [various dates]
*Classification based on the report titled, "Tracking the progress of state-funded projects that benefit colonias", written by the Office of the Texas Secretary of State, 2006.

Investigation of the Transboundary Santa Cruz Watershed (On-going)

- Focused, integrated research to develop an understanding of the complex interactions of the groundwater/surface water with the ecosystem it supports and the impacts on human health

Laura M. Norman, James Callegary, Charles van Riper III, Floyd Gray, Nicholas V. Paretti and Miguel Villarreal (USGS Arizona)



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http://pubs.usgs.gov/fs/2010/3097/

Study Area

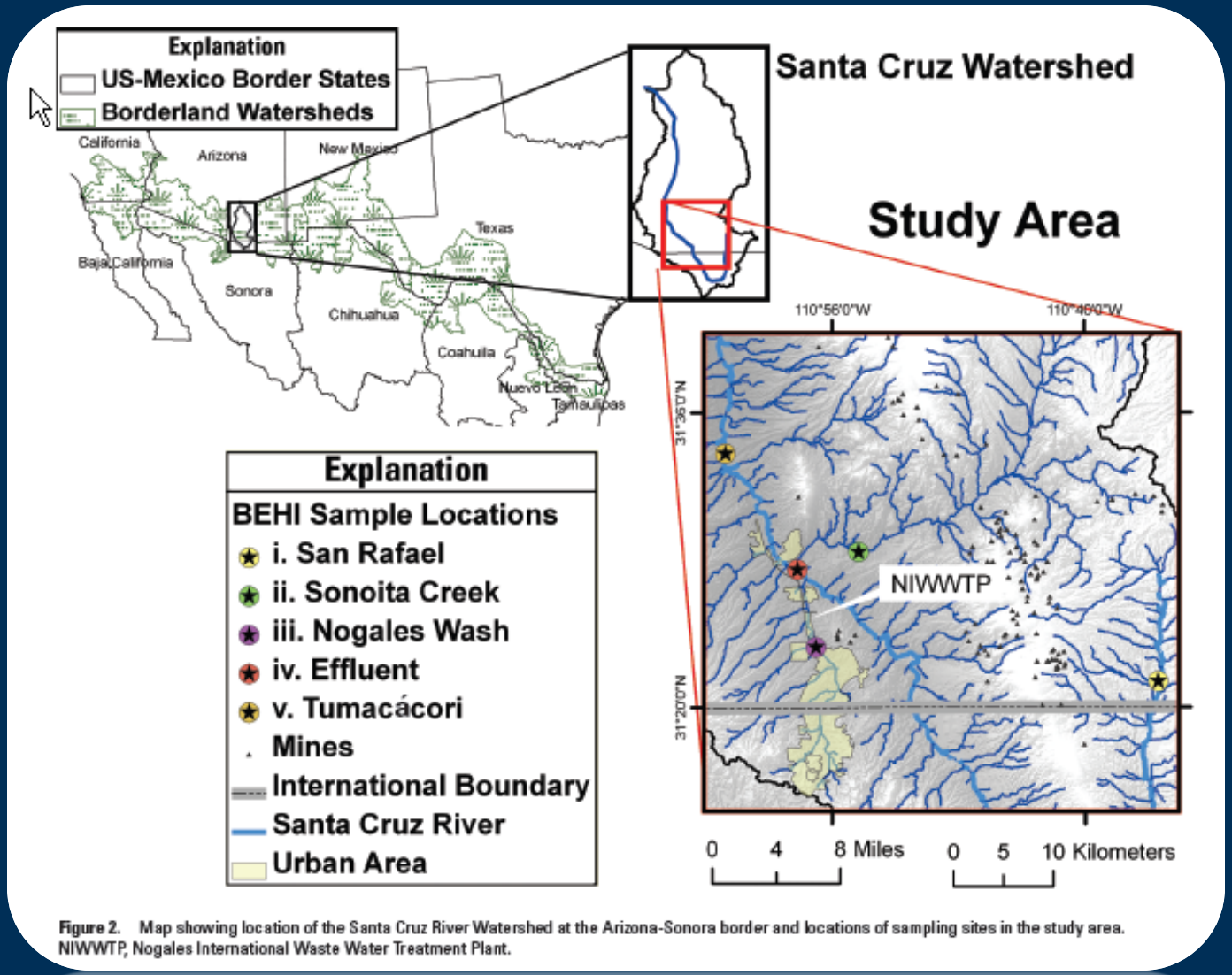

Figure 2. Map showing location of the Santa Cruz River Watershed at the Arizona-Sonora border and locations of sampling sites in the study area. NIWWTP, Nogales International Waste Water Treatment Plant.

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More information…

- Objective
  - to understand and document the complex movement of natural and anthropogenic contaminants through the SCR Watershed
- Methodology
  - Identify the presence of contaminants/pathogens at select locations in the watershed
  - Map areas of increased risk to animal and human populations
  - Assess the likelihood of the watershed as a source for human and animal pathogens
  - Compare risk patterns in the Watershed to Regional risk

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Current Activities

- Intensive data collection – contaminant and sediment transport
- SWAT modeling – improve understanding of human affect on aquifer dynamics and contaminant transport, BMPs
- Contacts:Laura Norman (lnorman@usgs.gov), James Callegary (jcallega@usgs.gov) – USGS Arizona

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US/MX Border – Mapping Instream River Habitat

- 2010 – USGS/USFWS
  - Assess the relation of seasonal flow conditions to available habitat, distribution, and recruitment of Rio Grande silvery minnow in the Big Bend reach of the Rio Grande.
  - Detailed field mapping of the river using high accuracy GPS/GIS.
  - Data acquired will be stored in a geodatabase and presented via on-line mapping application.

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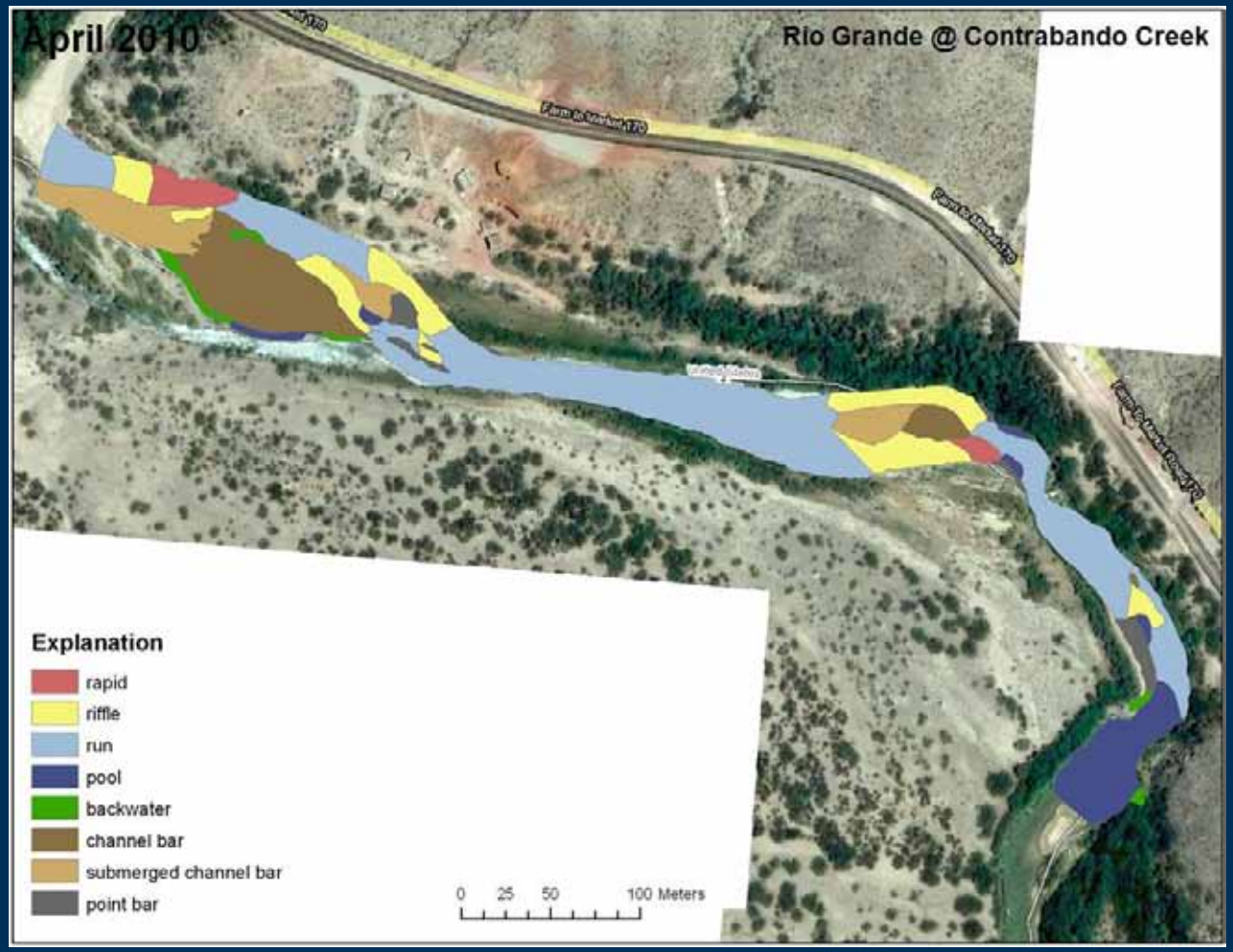
RGSM Border Products

- Mapped units (mesohabitats) will include:
  - fish assemblage
  - physical habitat
  - explanatory spatial variables
- Report FY12



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Realities

- Growth will continue
- Natural resources will continue to be stressed
- Need for geospatial data, updated information and maintenance is high
- Limited availability of Binational data, coverage
- Collaboration and data access difficult at times
- Funding decreasing

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Conclusions

- **BEHI contributions - serve as a pilot effort for management and access of border geospatial data resources**
- **We need to continue to invest and focus on our Border region to safeguard natural resources vital to biota and urban centers**
- **Raster and vector data resources valuable for continued monitoring efforts, investment needed in both areas**

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Acknoledgements

- Jean Parcher, USGS Hqtrs.
- Sylvia Wilson, USGS Hqtrs.
- Laura Norman, USGS AZ
- James Callegary, USGS AZ

- Rest of the USGS Interdisciplinary Team

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BEHI - http://borderhealth.cr.usgs.gov

Texas – http://tx.usgs.gov/GIS/

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