Technical Completion Report

Expand and Enhance Effective Partnerships
Develop and Share Critical, Multi-Jurisdiction Watershed Information with Stakeholders

Sponsored by U.S. Bureau of Reclamation

Prepared for
Paso del Norte Watershed Council

by

Z. Sheng, A. Michelsen and J. Villalobos
Agricultural Research & Extension Center
Texas Agricultural Experiment Station
The Texas A&M University System
1380 A&M Circle, El Paso, TX 79927

B. Creel
New Mexico Water Resources Research Institute
New Mexico State University

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Texas Agricultural Experiment Station
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I. Background

The activities and output of this USBR supported, Paso del Norte Watershed Council project was undertaken to enhance and further develop partnerships of the Paso del Norte Watershed Council. To improve understanding of the watershed environment and resources new information and easy access to resources data is critical. This will assist watershed stakeholders and the public in their efforts to improve watershed conditions and management.

In the multi-jurisdiction USBR Rio Grande Project Watershed of New Mexico, Texas and Mexico, limited information is available either within or across jurisdictions on critical factors necessary for understanding and improving watershed conditions. In particular, information on land uses and vegetation that directly affect the watershed have not been developed, compiled or made available across geographic and political jurisdictions. This project will develop this information and in doing so will accomplish several PdN Watershed Council objectives by fostering partnerships among organizations and stakeholders, and creating and providing access to multi-jurisdictional information necessary for watershed management. USBR funds for this project enabled leveraging of substantial other resources from a Hewlett Foundation grant to the Paso del Norte Water Task Force and matching and in-kind contributions from the Texas Agricultural Experiment Station, The Texas A&M University System and the New Mexico Water Resources Research Institute, New Mexico State University.

II. Project Tasks

1. Develop and expand partnerships with PdNWC, TAMU, NMSU, PdNWTF and IBWC through participation and interaction in this project.

2. Identify and quantify watershed land uses in the Texas portion of the Paso del Norte (Rio Grande Project) watershed in collaboration with PdNWC members, NMSU scientists, USBR, PdNWTF, IBWC and other organizations. Land use coverages will be developed from Parcel data from the County of El Paso with classification of commercial, residential, industrial and recreational land types for the urban area. For the agricultural area, NLCD data will be used to further classify crop types. Additional verification and modification will be conducted with satellite images, aerial photos and ground truthing as needed.

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3. Identify and quantify vegetative coverage in the Texas portion of the Paso del Norte watershed in collaboration with PdNWC members, NMSU scientists, USBR, PdNWTF, IBWC and other organizations. Special effort will be devoted to riparian zone vegetation and agricultural vegetative cover (e.g. annual row crops, perennial crops, orchards).

4. Vegetation coverage will be developed for the Rio Grande reaches between El Paso and Fort Quitman using National Land Coverage Datasets (NLCD). Additional verification and modification will be conducted with satellite images and ground truthing.

5. Historical land use and vegetative cover along Rio Grande is important for understanding watershed conditions and will be identified using historical aerial photos. Digitized copies will be geographically referenced by NMSU to enable identification and evaluation of changes in land use and vegetative cover and associated relationships to watershed conditions.

6. This new information on the Texas portion of watershed land use, vegetation and historical conditions will be shared and incorporated with similar information being developed on the New Mexico and Mexico portions of the watershed through a Hewlett Foundation grant to the New Mexico Water Resources Research Institute to support a Paso del Norte Water Task Force goal of providing seamless, consistent and matching watershed resource information across state and international geographic and political jurisdictions. This information will then be made widely accessible to PdN Watershed Council members, stakeholders, the public and other organizations via internet websites.

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III. Land Use Identification Utilizing GIS Methodologies and Multi-Resolution Land Classification (MRLC) Data Sets

Assessment of Riparian Zones

For this study a collection of (20) Multi-Resolution Land Classification (MRLC) sets were acquired via the web from the USGS. In order to do rapid analysis of these sets they were merged into one set. The merging of the data sets was done in Arc toolbox in ArcGIS. Total acreage of all classes within the merged file can be viewed within the attribute table in ArcGIS (Figure 1). Once the merge was completed a buffer of .5 miles was created around a Rio Grande shape file. The buffer was created to extract all the MRLC pixels within the buffer. Once the buffer extract was complete ArcGIS masked all land use classifications that were not riparian in nature (i.e. urban recreational grasses). A total of 5 classes were used for riparian zone classification in El Paso and Hudspeth Counties (Figure 2).

The acreage of the riparian zones along the Rio Grande was extracted from the buffer to calculate the pixel count just for the 5 classes within the buffer along the Rio Grande in El Paso and Hudspeth Counties, Texas (Table 1a) and in Dona Ana County, NM (Table 1b).

Table 1a. Estimate of riparian areas within the buffer along the Rio Grande in Texas

Class	Pixel count (1=30x30m^2)	Area (km^2)
11 open water	7,781	7.00
41 deciduous forest	1	0.0009
42 evergreen forest	345	0.31
51 shrubland	116,991	105.29
71grassland/herbaceous	77,247	69.52
92 emergent herbaceous wetland	89	0.0801

Table 1b. Estimate of riparian areas within the buffer along the Rio Grande in New Mexico

Class	Pixel count (1=30x30m^2)	Area (km^2)
11 open water	7400	6.66
41 deciduous forest	329	0.30
42 evergreen forest	5	0.0045
51 shrubland	75933	68.34
71grassland/herbaceous	42340	38.11
92 emergent herbaceous wetland	1	0.0009

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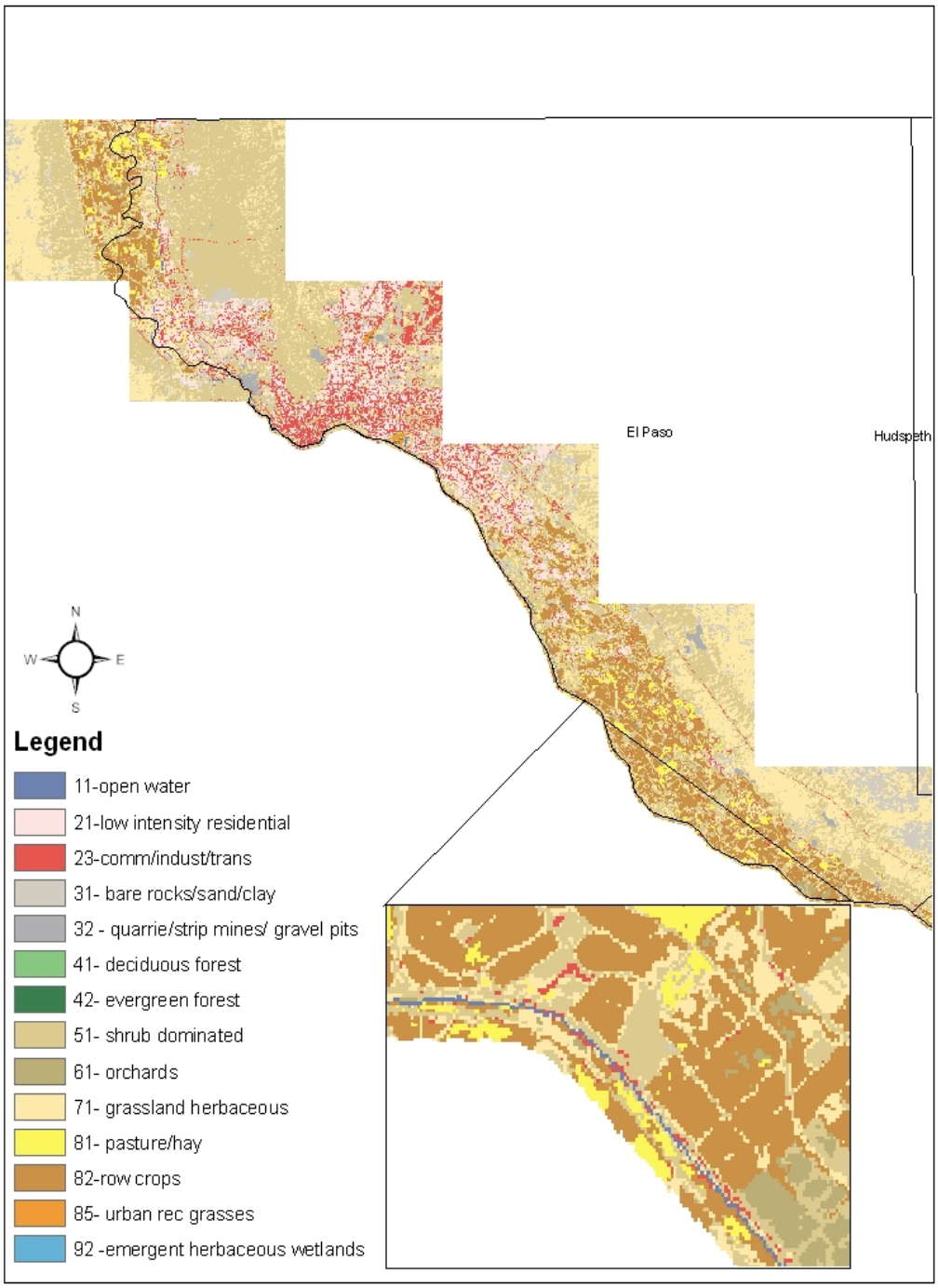

Figure 1. Merged MRLC sets in El Paso County.

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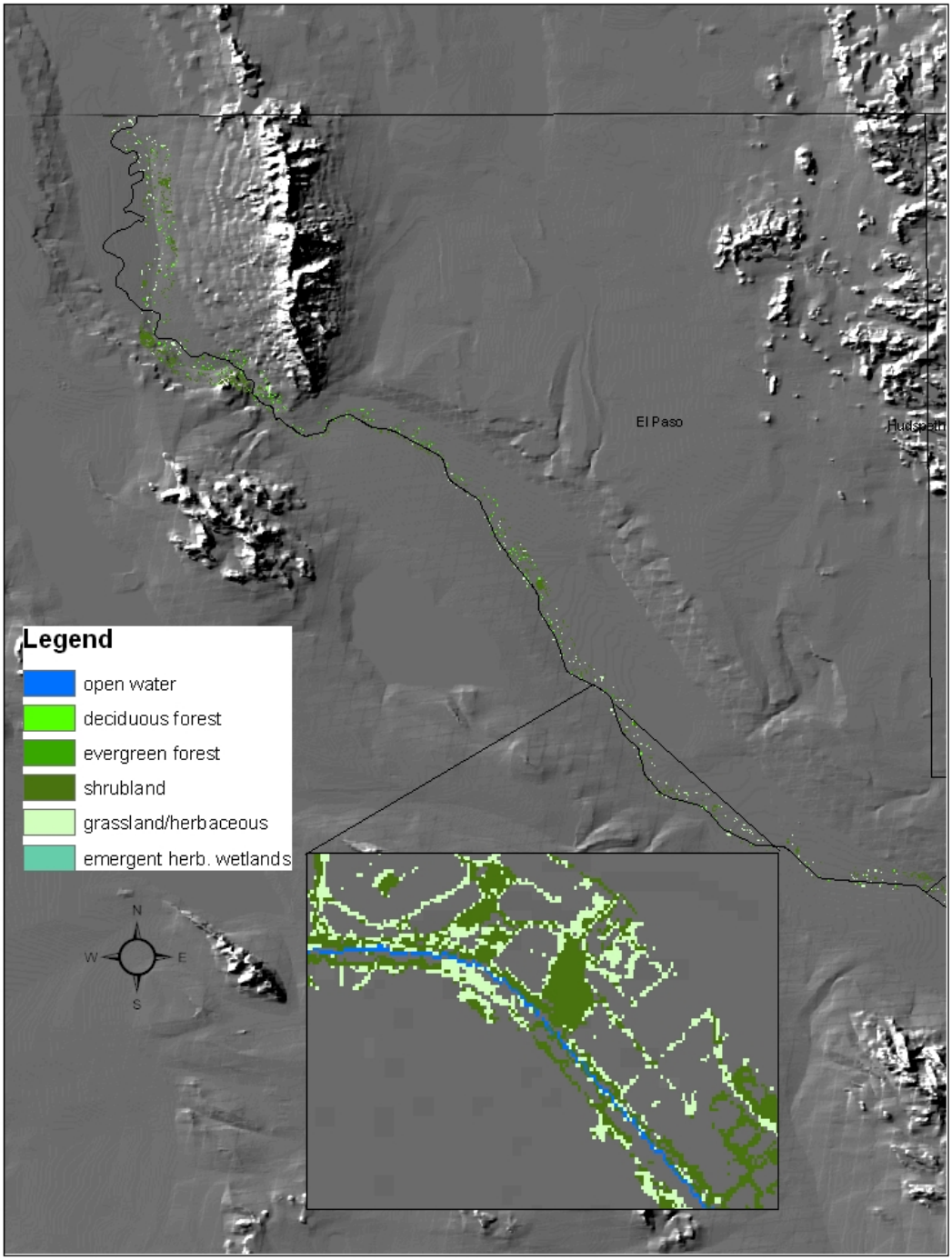

Figure 2. Riparian classes within buffer zone.

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Classification of Land Uses

Property classification was done by using El Paso Central Appraisal District GIS dataset. The dataset was clipped using a Rio Grande Alluvium shapefile (Figure 3). The Rio Grande Alluvium shapefile was used because its boundary encompasses the major argricultural regions of El Paso County. A relief map was used as a background to show the low-elevation regions of the Rio Grande Flood plain. The clipping was done to minimze the size of the data set. Once clipped the data was classified into agriculture, industrial, commercial, and residential color classes. Total acreage for each category can also be estimated using the GIS tools.

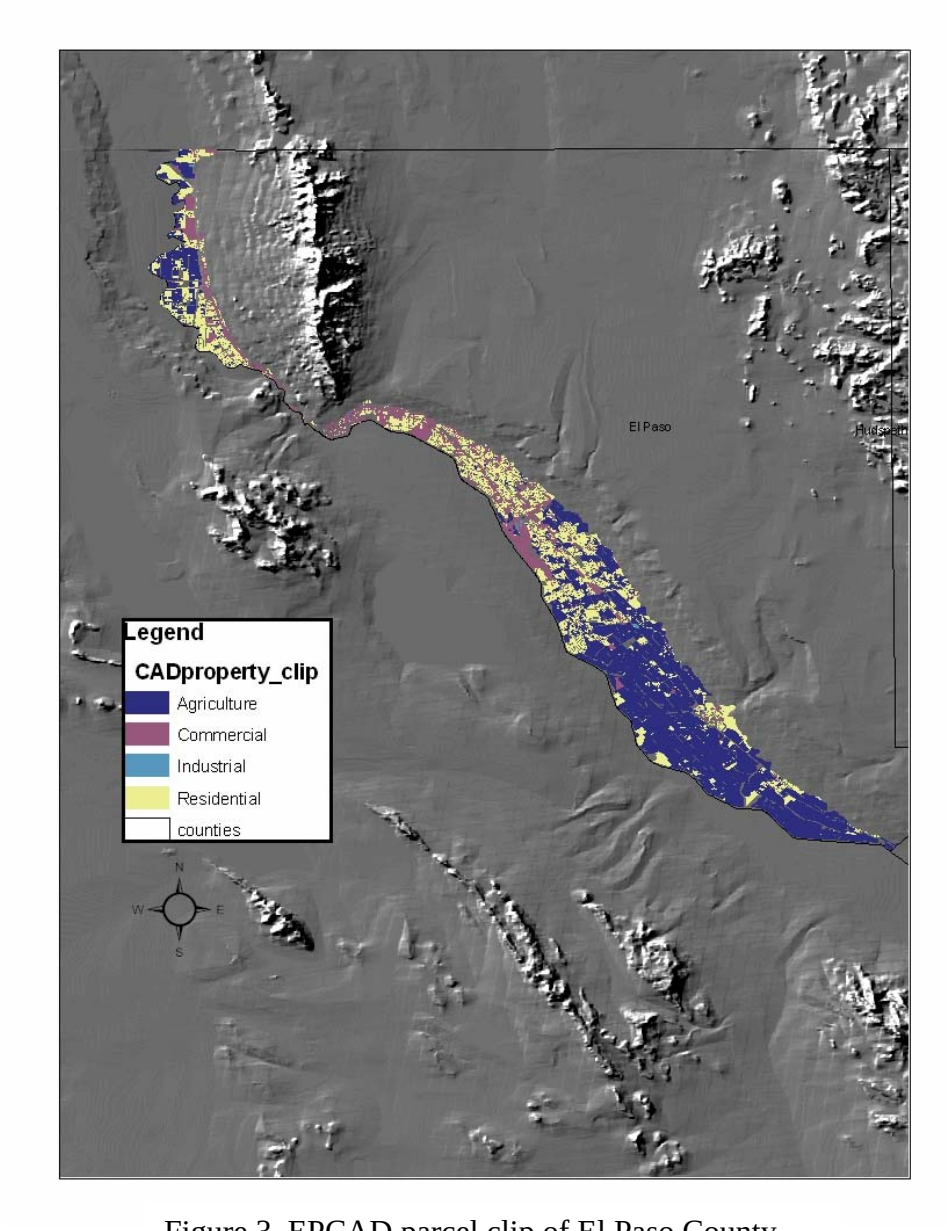

Figure 3. EPCAD parcel clip of El Paso County.

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Data Sources:
Following table lists sources of data used in this project (Table 2).

Table 2 Data sources

Data:	**Source:**
Riparian Zone	USGS: http://gisdata.usgs.net/website/MRLC/viewer.php
CAD property parcels	El Paso Central Appraisal District
Counties	Texas Water Development Board
Riparian Zone buffer	Buffer was created in Arc Map and has a radius of .5 mi.
Relief	New Mexico Water Resource Research Institute
MRLC	USGS: http://gisdata.usgs.net/website/MRLC/viewer.php

Historical land use in the Lower Rio Grande of New Mexico
To evaluate the historical land use and vegetative cover in the Lower Rio Grande in the New Mexico portion of the watershed requires using historical aerial photos. A review of available aerial photo series was conducted and evaluated for potential use in determining land use and vegetative cover. These aerial photo series are presented in Table 3. Historical (pre 1992 series) aerial photo series would require digitizing (scanning) and geographic referencing. More recent (1992 and later) aerial photo series are available in geographically referenced digital form. Most of these have been acquired and incorporated into the project web server. Hosting of these aerial photo series will enable scientists and others to identify and evaluate changes in land use and vegetative cover over time.

As indicated in Table 3, the 1996 and 2005 DOQQs have been acquired and are available from the ftp site: ftp://river.nmsu.edu. Figures 4 – 7 present screen captures of the ftp site and examples of delivery. Paso del Norte Watershed Council members will be surveyed to determine which of the historic aerial photos series would provide the most benefit. At the time of this report their recommendations have not been received. Initial discussions have been held with the US Army Corps of Engineers – Albuquerque District personnel regarding access to their scanning equipment. Georectifying the scanned images can be conducted in the NMWRRI GIS Laboratory and the images can be added to the FTP site.

Users of the website and FTP site can select and download images and metadata to their local machines and incorporate into their evaluation programs. Future enhancements to the website and its ArcIMS application will include the DOQQs in the layers available. The ArcIMS system allows users to produce maps without the need to download data and images and to have the necessary mapping software.

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Table 3. Aerial photo series for Lower Rio Grande in New Mexico

Series acquisition date	Source	Type & Resolution	Availability
1936	USDA FSA Aerial Photography Field Office, Salt Lake City, UT	B/W 4 inches = 1 mile	Prints available, scanning and geo-referencing required
1947	USDA FSA Aerial Photography Field Office, Salt Lake City, UT	B/W 6 inches = 1 mile	Acquisition required, scanning and geo-referencing required
1960	USDA FSA Aerial Photography Field Office, Salt Lake City, UT	B/W 6 inches = 1 mile	Acquisition required, scanning and geo-referencing required
1967	USDA ASCS Aerial Photography Center, Salt Lake City, UT	B/W 6 inches = 1 mile	Acquisition required, scanning and geo-referencing required
1974	USDA ASCS Aerial Photography Center, Salt Lake City, UT	B/W 6 inches = 1 mile	Prints available (45), scanning and geo-referencing required
1996	U.S. Geological Survey Center for Earth Resources Observation and Science (EROS) 47914 252nd Street Sioux Falls, SD 57198-0001	CIR & B/W 1:24,000 1 meter/pixel	DOQQs acquired & available from ftp://river.nmsu.edu
2003	U.S. Geological Survey Center for Earth Resources Observation and Science (EROS) 47914 252nd Street Sioux Falls, SD 57198-0001	CIR & B/W 1:24,000 1 meter/pixel	DOQQs available at $3.75/doqq via ftp from USGS EROS
2004	Dona Ana County Flood Control Commission	CIR 1:12,000 ~5 inches/pixel	DOQQs available at $10,000/set
2005	New Mexico Geospatial Data Acquisition Coordination Committee (GDACC), State of New Mexico	CIR 1:12,000 ~5 inches/pixel	DOQQs acquired & available from ftp://river.nmsu.edu

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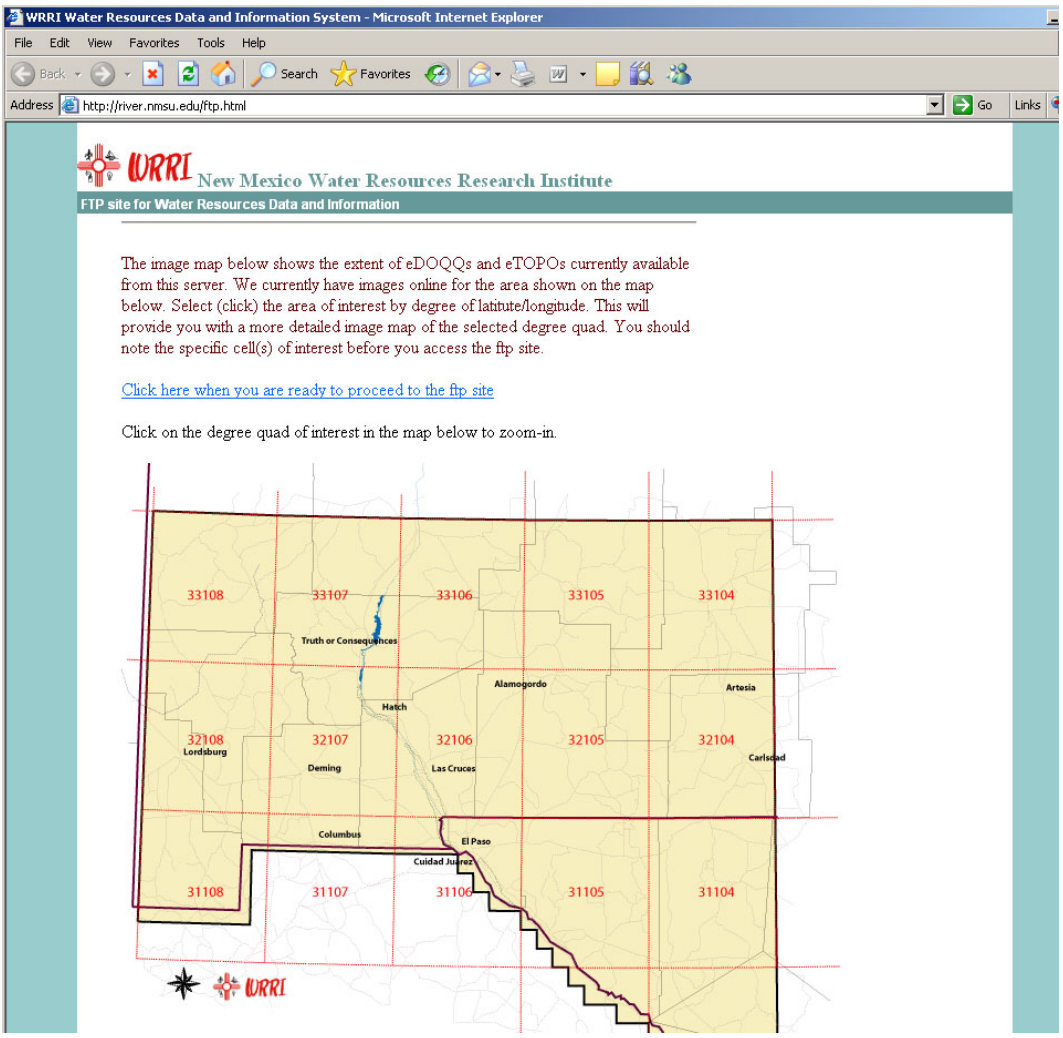

Figure 4. Gateway page to the FTP site at http://river.nmsu.edu/ftp.html

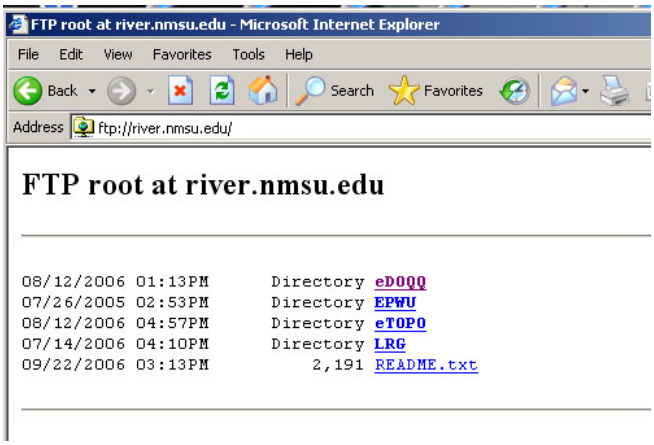

Figure 5. FTP site at river.nmsu.edu

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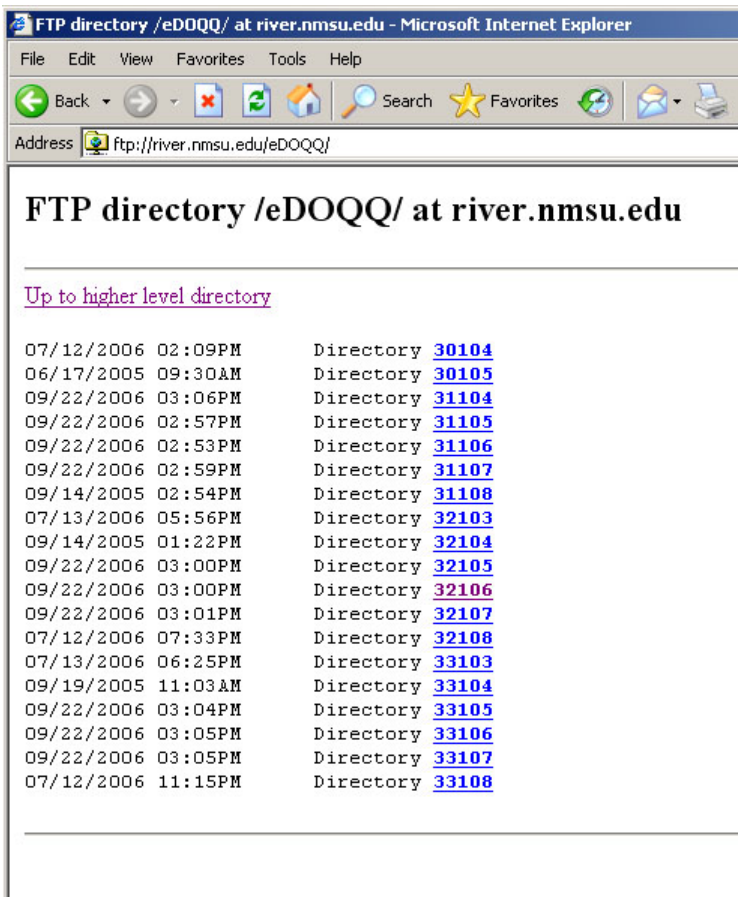

Figure 6. Listing of FTP directory /eDOQQ/ at river.nmsu.edu

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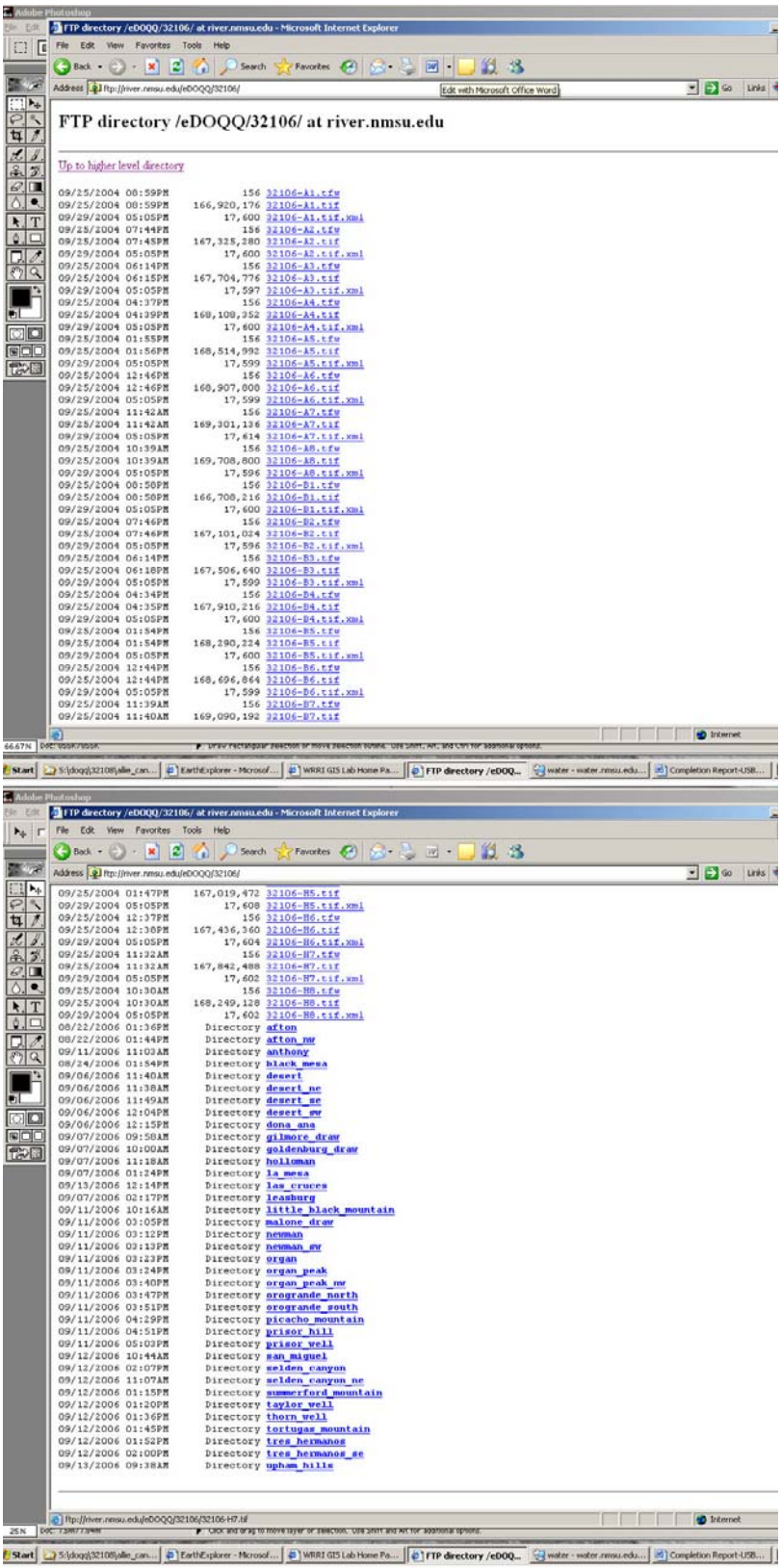

Figure 7. Listing of FTP directory /eDOQQ/32106/ at river.nmsu.edu