Rio Grande Hydrologic Applications

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Remote Sensing Workshop
Water Education Foundation
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San Diego, California
Texas Commission on Environmental Quality

Bryan W. Shaw, Ph.D.
Chairman

Buddy Garcia
Commissioner

Carlos Rubinstein
Commissioner
Outline

• Overview of Rio Grande basin
• Flooding
• Invasive Species
• Water Quality
• Water Shortages
Rio Grande: Context

- 335,000 sq. miles
- 1944 Water Treaty
  - Allocates water between U.S. & Mexico
  - Mexico must provide 350,000 acre-feet every year to U.S., in cycles of five years
- Principal agricultural areas in Conchos basin (Mexico) and Lower Rio Grande Valley (Tamaulipas and Texas)
Hurricane Alex

• Massive precipitation affecting Nuevo León and Lower Rio Grande Valley of Texas
• Infrastructure damages to Monterrey
  • Roads
  • Water/wastewater service
  • Utilities
  • Flooding in Anahuac
Hurricane Alex

National Hurricane Center—Last Messages for Alex
07.02.2010  Forecast/Advisory #26
Discussion #26
Public Advisory #26

Complete Message Archives
Hurricane Alex
source: National Hurricane Center.

2010 Hurricane Season Summary

<table>
<thead>
<tr>
<th>Name</th>
<th>Active?</th>
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<tbody>
<tr>
<td>Tropical Storm Danielle</td>
<td>Yes</td>
</tr>
<tr>
<td>Tropical Depression Five</td>
<td>No</td>
</tr>
<tr>
<td>Tropical Storm Colin</td>
<td>No</td>
</tr>
<tr>
<td>Tropical Storm Bonnie</td>
<td>No</td>
</tr>
<tr>
<td>Tropical Depression Two</td>
<td>No</td>
</tr>
<tr>
<td>Hurricane Alex</td>
<td>No</td>
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</tbody>
</table>

Storm Names for 2010
Alex, Bonnie, Colin, Danielle, Earl, Fiona, Gaston, Hamline, Igor, Julia, Karl, Lisa, Matthew, Nicole, Otto, Paula, Richard, Shary, Tomas, Virginie, Walter

T.D. Alex, Advisory 1
4:00 PM  16.5°N, 83.5°W  35 mph  1004 mb  WNW at 10 mph
Flooding in Mexico during Hurricane Alex
7-day Precipitation Estimates in the Rio Grande Basin
La crecida bombardeó literalmente la pulga que se instala bajo el Puente del Papa, en el lecho del Río Santa Catarina.
CANCHAS
El Parque Rio, que comprendía canchas de fútbol, arquilla, una plataforma de práctica y un campo de golf, fue arrasado por la crecida del Santa Catarina.
Flooding in Mexico during Hurricane Alex

Carranza, Nuevo Laredo, Laredo, Falcon, Gomez, McAllen, Reynosa, Brownsville, Matamoros, Monterrey, Corpus Christi, El Cuchillo

NASA Aqua MODIS
July 11, 2010, at 1454 CDT
SWIR/VNIR Channels 7,2,1

Collected by the MAGIC DBRS, Center for Space Research, UT-Austin
Flooding in Mexico during Hurricane Alex

NASA Aqua MODIS
July 11, 2010, at 1454 CDT
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Collected by the MAGIC DBRS,
Center for Space Research, UT-Austin
Flooding in Mexico during Hurricane Alex

NASA Aqua MODIS
July 11, 2010, at 1454 CDT
Visible Channels 1,4,3

Collected by the MAGIC DBRS,
Center for Space Research, UT-Austin
Eagle Pass-Piedras Negras, Coahuila
Port of Entry
Falcon Reservoir releasing flood waters into the Rio Grande in July 2010

Falcon Dam view from above at the max flow

Falcon view overhead

Falcon Dam - Elev 309.31 ft on 7/17/10 (old record was 308.1 in Oct 1958) : Storage was 3,788,539 af

Maximum release during this even was 1,700 cms/ 60,035 cfs :

Lasted for 13 days at that rate

Normal releases for July average 2400 cfs.
Rio Grande City-Camargo POE
July 2010
2010 FLOOD OPERATIONS
DIVERGENS INTO THE US FLOODWAY

Anzalduas Dam
8/15/10
Water Hyacinth

- Invasive Species
- Explosive Growth
  - Up to 200 tons/acre
  - Can completely clog waterways
- Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) can monitor infestation
Water Hyacinth

- ASTER infrared imagery

Top:
Mar. 30, 2002

Bottom:
May 9, 2002
This aerial photo shows the Rio Grande in Reynosa in 2005, and there is a stream that connects to the river that is emitting pollutants that are turning a large part of the river white.
Reynosa outfall January 2009

This is the same aerial photo as the previous slide, except it was taken in 2009 and there is no longer any visible pollution in the river being emitted from the stream.
La Boquilla June 25, 2002
TCEQ Needs

• Precipitation data for storm events in Rio Grande basin
• Types and acreage of crops in the Rio Grande basin
• Groundwater use in Mexico
  • May 30 NYT article about GRACE
• Flows?
¡Fin!

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