Maps & Myths...

Bay Area, 1990

Bay Area, 1519?
Maps and Myths: Charting Change in the Coastal Bend

✅ Objective: Use historical documents and current datasets to track changes in the landscapes of South Texas.
  - Find scientifically accurate maps and air photos
  - Overlay old data on photogrammetrically-corrected contemporary satellite images
  - Difference between the two is change

✅ To understand the current dynamic state, past development and future of South Texas
Roadmap of Investigation

✔ Keynote Question.
✔ Modern examples of change.
✔ Geologic Setting for Macro-Changes.
✔ Modern (2.1 Mybp-today) interglacial setting for Micro-Changes.
✔ Survey of human attempts to map and document the South Texas coastal zone.
✔ Thesis Topics???
Can we predict the future effects of current activities?

The present is the key to the past!

Blind Oso, 1997
The Pattern is Change...

- Landscapes evolve over time.
- Ecosystems evolve in response to those physical changes.
  - Organisms change with the environment
- Ecological Succession in South Texas
Early successional landscapes evolve and mature into...Different Biomes

- Increasing vegetation
- Increasing clay content
- Increasing nutrients
- Increasing biodiversity

Padre Island
~ 5,000 years old

Ingleside Strand Plain
~ 120,000 years old
**Geologic Setting:**

- Bottom of shallow sea in Cretaceous period (65 Mybp)

- Sediments shed from highlands to west and north fill in basin of the nascent Gulf of Mexico (Sonora Megashear?)

- Currently sitting atop lens-shaped sediment wedge ~35,000 feet in thickness (oil and gas source areas.)
Agua Dulce to -200 meter surface

Villarreal, 1998
Quaternary Shoreline position

Villarreal, 1998
Prediction #1

- Evidence of the paleo-Nueces channel can be found in high-resolution (<5 m) GLORIA sonar rangings.
- Quaternary fossil beds and evidence of early human habitation will be located here.
- Source: Contemporary USGS 10 m bathymetry
Modern Setting

Example of modern satellite imagery at 30 meter resolution.

1845'6

The routes in the direction of Matamoras are made from the examinations of Capt. Saunders and Lieut. Scarlett of Corps of Engineers. The remainder of the map from actual survey and examinations by J.E. Blake, U.S. Top. Eng.

Most of the streams in Beeza and San Patricio counties have been surveyed and the lands on their immediate borders, taken up.
Blake and Meade,

1845-6
What were these people mapping?
Earliest Maps (1519-1700) Useless

✅ Theodolite (1571) was available.
❌ Chronograph (1864) was not available.
❌ Spatial control ±50 miles.
1833 Rectified to Satellite Image

General Teran, 1833

Villarreal, 1998
How NOT to look for change.

• Hommano is one of the first maps with recognizable terrain boundaries, BUT...

• Focused on the relative position of coastlines, rivers, trails and passes.

• In areas of interest!

Hommano Map, 1720
Early Errors or Early Clues I

- Astronomical baseline to Monterey and mouth of the Sabine River.
- First appearance of detail fine enough for modern comparisons.
  - Coastal Bend
  - CC and Nueces Bays
  - Pass into CC Bay
  - Land Cut?
  - Aransas Bay

General Teran, 1833
Early Errors or Early Clues I

General Teran, 1833
Early Errors or Early Clues II

Greenleaf, 1840
Error?

Or

Clue?
Prediction #2

- Evidence of a paleo-lagoon can be found in sediments cores along the axis from present-day Ingleside to the extreme southeastern arm of Aransas Bay.

- **Laguna Abuela**
  
  **Source:** 1833 & 1840 maps
1859 Corpus Christi Ship
Channel Company
Evidence?

Anthropogenic Activity
Erosion
Deposition

1859 Ship
Channel Co.
- vs. -
1990 satellite
Evidence for Historically Documented Migration of Aransas Pass
The problem with Corpus Christi Pass

Here!

Not Here!

Here!
Change Detection of Contemporary Events

R/G Change Detection Image
R= Landsat TM 1990
G= Landsat MSS 1972
Geodetic Datum= NAD83
Map Projection= NUTM14

Villarreal, 1998
Barrier Island Build-up

Red = new land
or increased veg.

Green = new water
or loss of veg.
Urbanization of the Southside

Red = new land or increased veg.
Green = new water or loss of veg.
Red=new land or increased veg.
Green=new water or loss of veg.

Dredge Spoil from expansion of La Quinta Channel project
Conclusions

✓ Applying contemporary knowledge and visualization tools to pre-existing maps can provide new insights.

✓ With strong skepticism:
  - The most bizarre map feature has some basis in reality.
    • Even the mistakes can tell you something.
  - Trust the surveyors and scientists of yesteryear.

✓ Document and preserve the datasets being gathered today. They are the historical record for the next generation.
What we wish we had...

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Bay Area, 1519 ?