Using GIS to Measure Modern Development at Teotihuacan, Mexico
Acknowledgements

- Dr. L.J. Gorenflo
  Department of Landscape Architecture
  Pennsylvania State University

- Dr. Ian G. Robertson
  Department of Anthropology
  Stanford University
Problem

What extent of the ancient Teotihuacan site has been impacted by modern development?

“Modern Development” = structures and agriculture.
*Designated a UNESCO World Heritage site in 1987, Teotihuacan is approximately 45 km northeast of modern Mexico City.*
Teotihuacan was recognizable as an urban center by ~ 100 BCE and reached its height ~ 550 CE. Estimated population near 100,000 and covered ~ 20 sq km.

In the 1960s, the site was surveyed by a team of archaeologists led by René Millon in the Teotihuacan Mapping Project (TMP).

Approximately 2,200 multifamily apartment compounds and over 800 insubstantial structures identified through the TMP.
Modern Background

- Two *municipios* lie within the extent of Teotihuacan – San Juan Teotihuacan and San Martín de las Pirámides.

- Approximately 80% land use in these *municipios* was estimated to be agricultural with only 7% urban.

- Both have shown a marked population increase in both of 15% - 20% between 2000 and 2010. This is a continued increase in population since the mid-century.
San Juan Teotihuacan
San Martín de las Pirámides

<table>
<thead>
<tr>
<th>Environment (2005)</th>
<th>Square Km</th>
<th>Percent</th>
<th>Square Km</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Area</td>
<td>83.16</td>
<td></td>
<td>67.22</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>72.18</td>
<td>86.80%</td>
<td>49.46</td>
<td>73.58%</td>
</tr>
<tr>
<td>Grassland</td>
<td>2.54</td>
<td>3.05%</td>
<td>6.16</td>
<td>9.16%</td>
</tr>
<tr>
<td>Forest</td>
<td>0</td>
<td>0</td>
<td>.24</td>
<td>0.36%</td>
</tr>
<tr>
<td>Xeric Bush</td>
<td>2.87</td>
<td>3.45%</td>
<td>7.18</td>
<td>10.68%</td>
</tr>
<tr>
<td>Secondary Vegetation</td>
<td>0</td>
<td>0</td>
<td>2.35</td>
<td>3.50%</td>
</tr>
<tr>
<td>Urban</td>
<td>5.56</td>
<td>6.69%</td>
<td>1.83</td>
<td>2.72%</td>
</tr>
</tbody>
</table>

**Population Growth**

- San Juan Teotihuacan
- San Martín de las Pirámides
Archaeological Zones

The Central Area of Archeological Monuments was established by presidential decree in 1964 to protect the site, and in 1988 this was expanded into three protected zones:

Zone A – Central Area of Archaeological Monuments.

Zone B – Extended Area of Archaeological Monuments.

Zone C – General Protection Area.
Methodology

- Render modern development as a polygon layer.
- Render extents of ancient city as a polygon layer based on the survey maps of René Millon’s Teotihuacan Mapping Project.
- Calculate area of the pre-Hispanic site that is impacted by modern development.
Render Modern Development as a Polygon Layer.
Render TMP as a Polygon Layer.
By Regions

- The TMP Map.
- The Archeological Zones.
- Areas identified as most critical are those regions within the extents determined by the TMP but fall outside the protected archaeological zones.
By Region

Survey Area Under Protection

- Zone A: 8%
- Zone B: 36%
- Zone C: 31%
- Unprotected TMP: 25%
By Features

- **Total Area of TMP** = 900 ha
- **Total Area of Development** = 2,680 ha
  - Structures – 978 ha
  - Agriculture – 1,702 ha
- **Overlap** = 435 ha
- **48% of TMP Features total.**
Incorporating Historical Imagery

1965 =
Buildings = 35 ha
Fields = 90 ha

2012 =
Buildings = 230 ha
Fields = 159 ha
Summary

What extent of the ancient Teotihuacan site has been impacted by modern development?

- Nearly 25% of the area surveyed by the TMP lie outside Zones A, B, and C.
- 218 hectares of features identified in the TMP are under modern structures which is ~ 24% of the TMP features.
- 217 hectares of TMP features are under fields which is another ~ 24% of the total TMP.
- Grand total of 48% of the site impacted.
Questions?