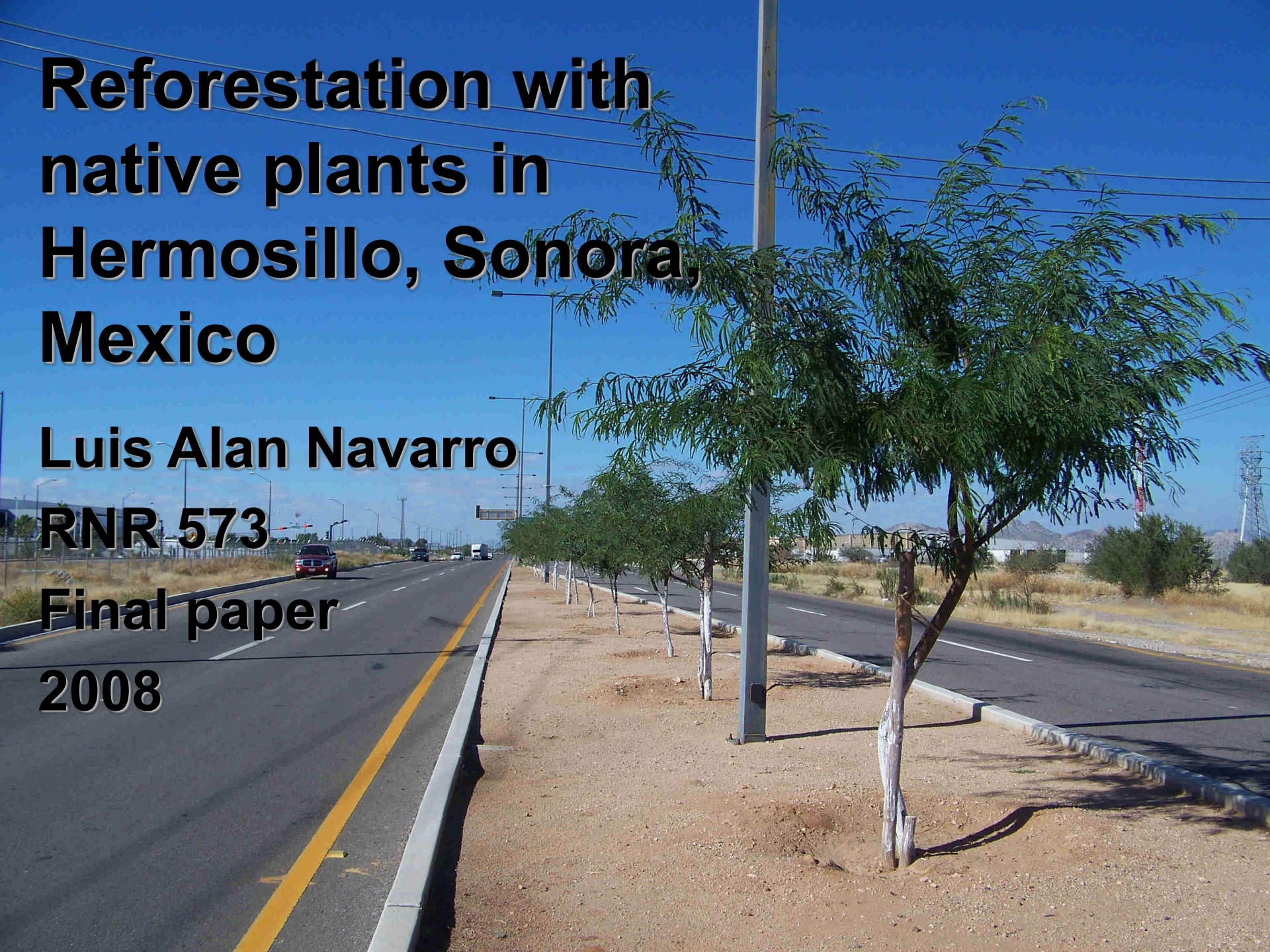

Reforestation with native plants in Hermosillo, Sonora, Mexico

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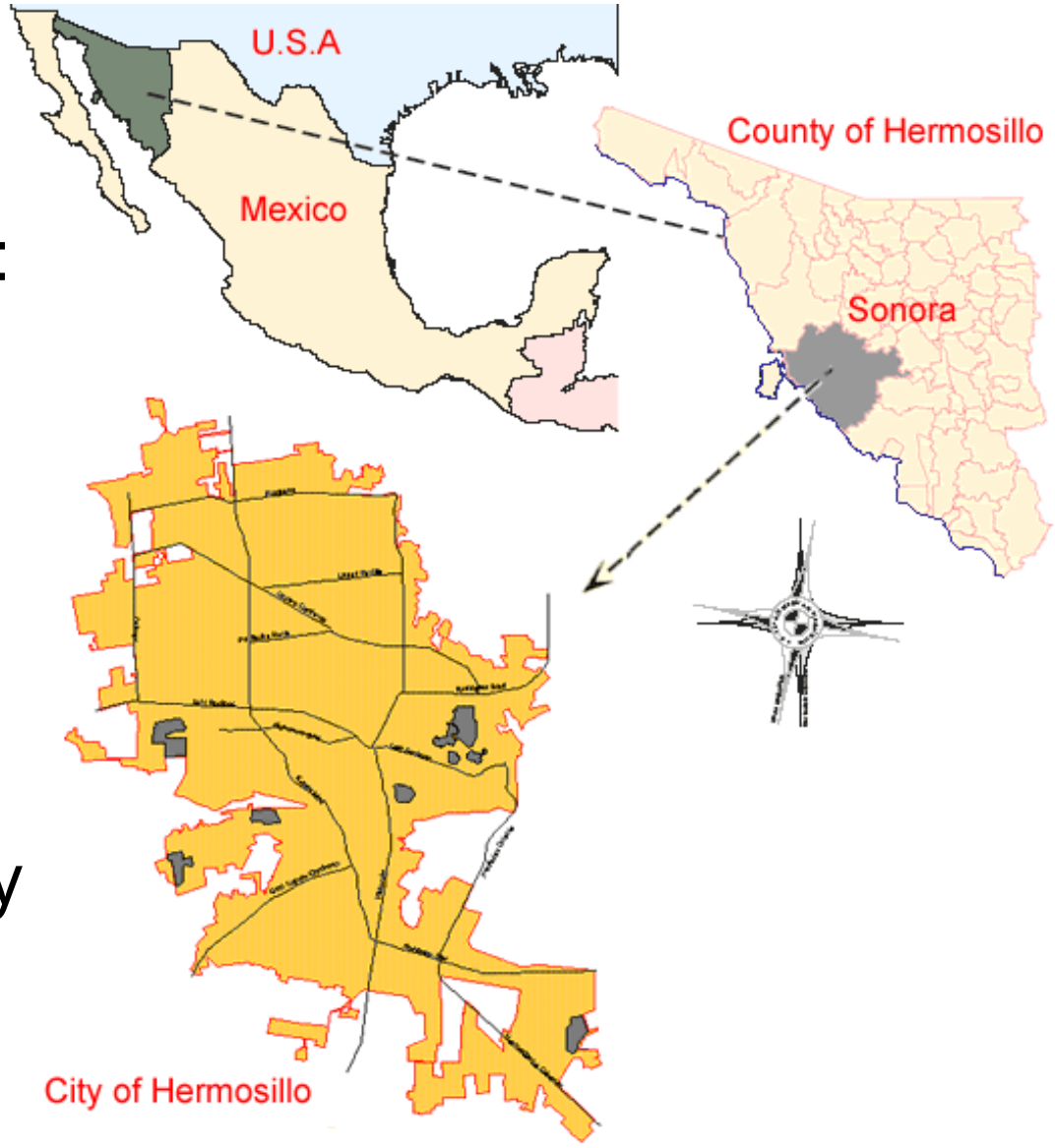
RNR 573

Final paper

2008

About Hermosillo:

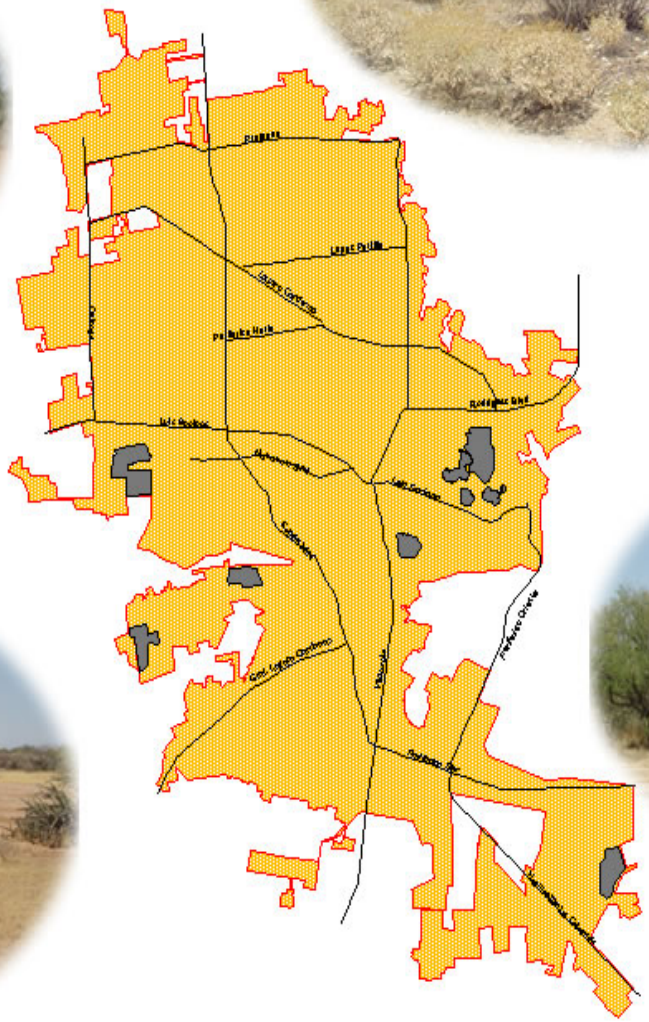
- It's my hometown
- Population in 2005: 641,791
- City area in 2005: 30,206 acres
- Elevation is about 708 ft
- Rain: 12.6"
- Temperature in July reaches 118°F

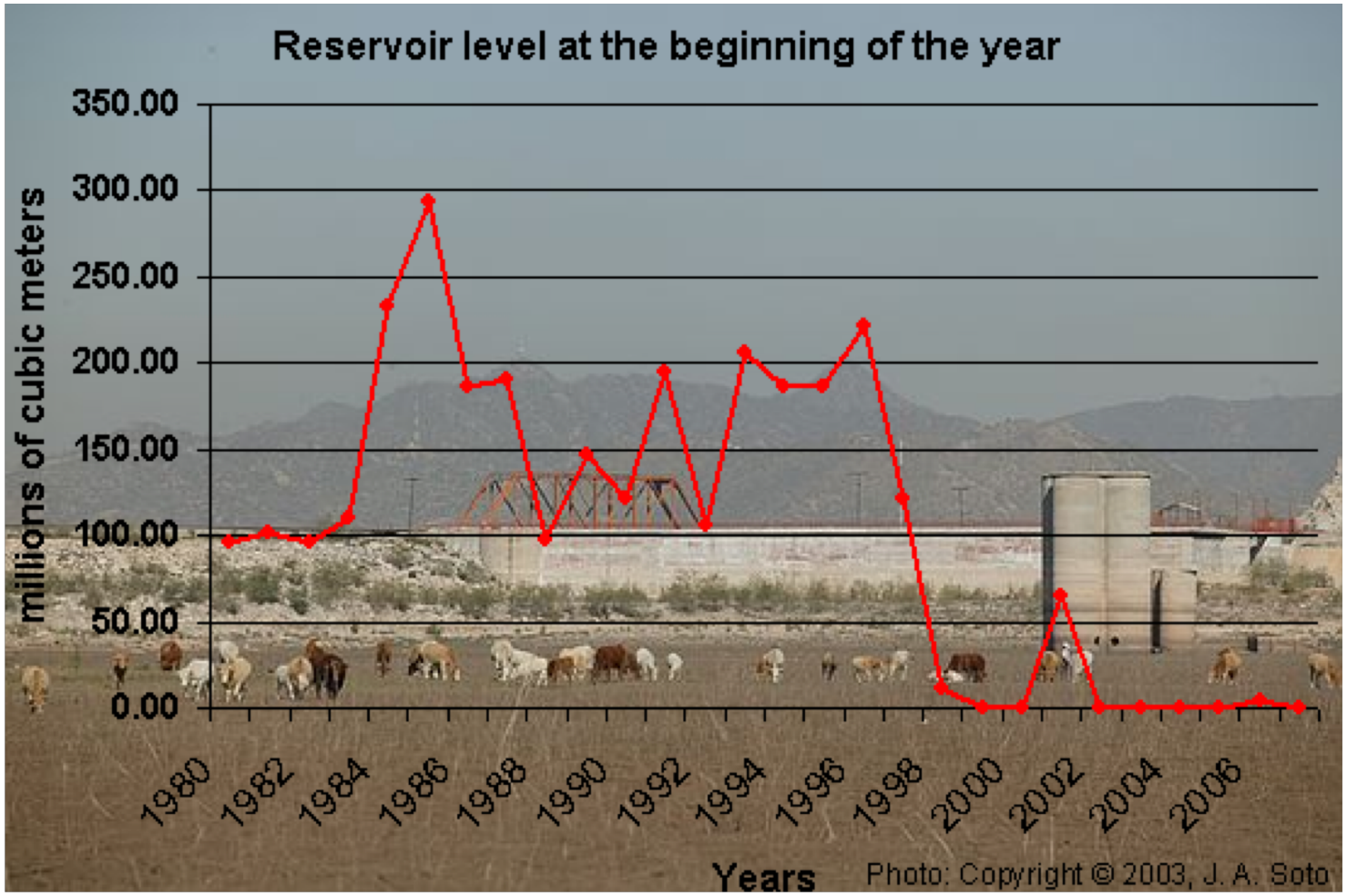


Statement of the problem:

- City located in a very arid environment
- City has severe drinking water shortages due to recently drought periods
- During 2006-2008 the neighborhoods had only 8 hours of water supply
- Homeowners and developers are not reforesting with native plants which are resistant to drought and require low watering. Instead they plant exotic species.

Vegetation around Hermosillo city




Reservoir level at the beginning of the year
millions of cubic meters
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
Years
Photo: Copyright © 2003, J. A. Soto

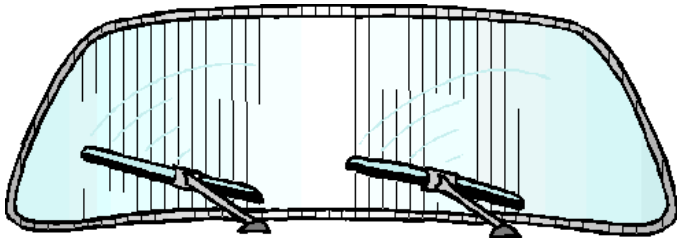
Objectives

- To sample (counting) the number of streetside and front yard trees, recording the number of trees per species.
- To divide the city into two areas: that developed before 1992, and the one developed after that.
- To find if the urban reforestation have changed in recently developed areas compared to those developed before 1992.

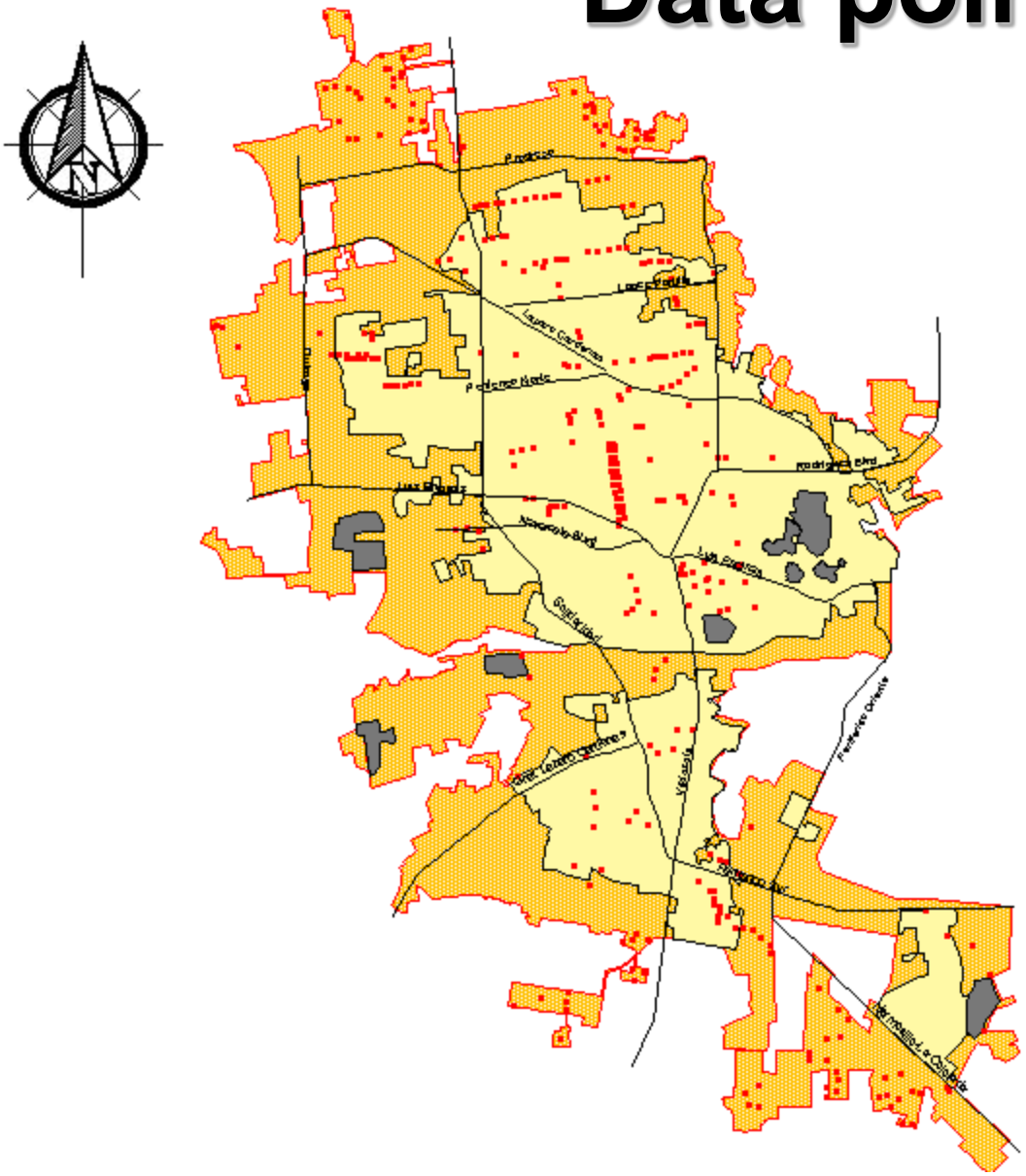
Research questions

- Are newly developed areas planted with more native species? **Ho: Yes**
- Do recently developed areas have more trees? **Ho: No**
- Do recently developed areas have more diversity? **Ho: No**

Transect sampling



Data points = 340



Variables

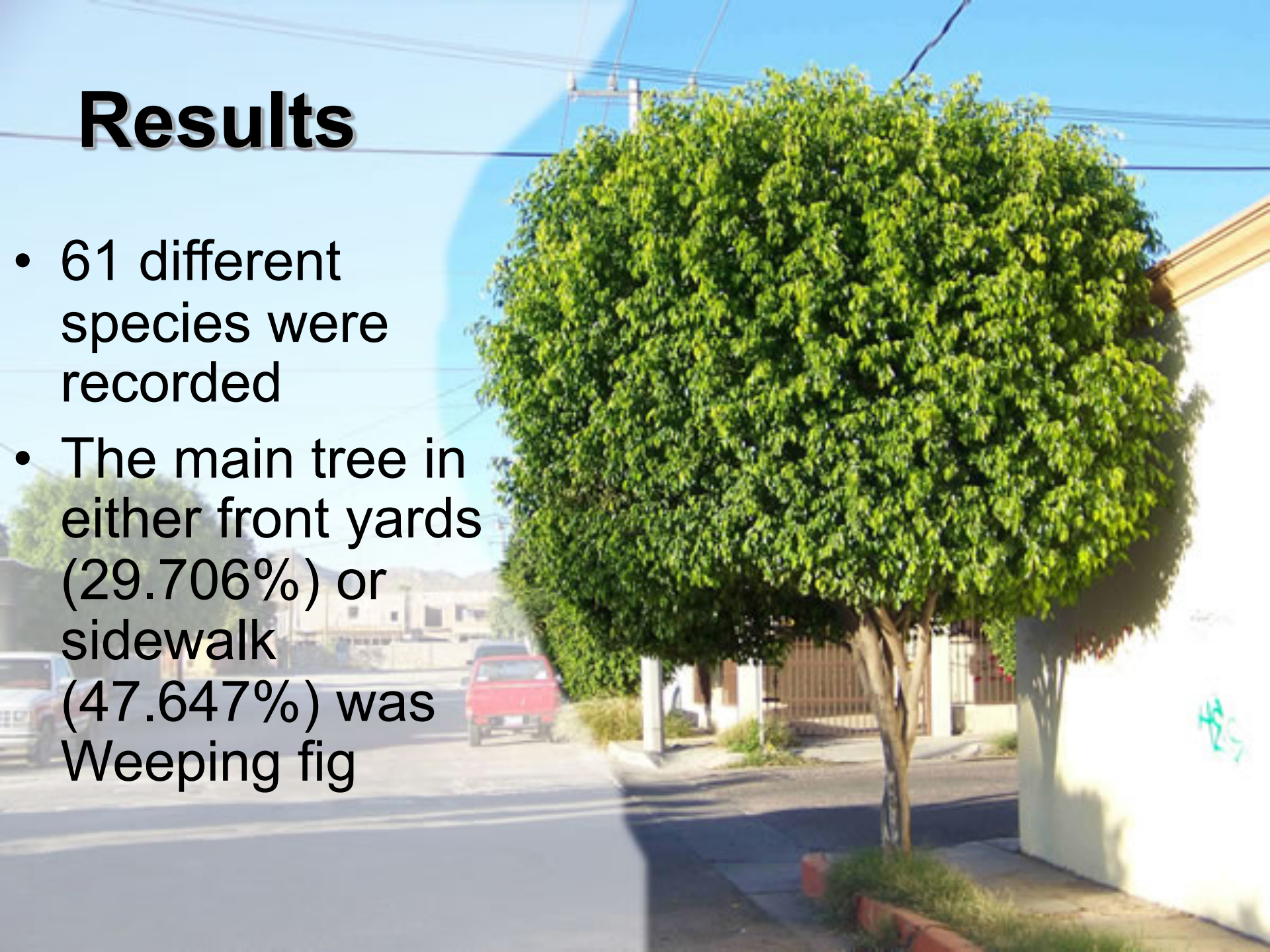
Variable	Description
trees_sw100	Sidewalk trees @ 100 meters
pnative_fy	Percentage of native trees in front yard
pnative_sw	Percentage of native trees @ 100 meters of sidewalk
sid_fy	Simpson's Index of Diversity in front yard
sid_sw	Simpson's Index of Diversity along sidewalk

The Simpson's index of diversity (SID) value ranges between 0 and almost 1, the greater the value, the greater the sample diversity. The index represents the probability that two individuals randomly selected from a sample will belong to different species.

$$SID = 1 - \frac{\sum n(n-1)}{N(N-1)}$$

Results

- 61 different species were recorded
- The main tree in either front yards (29.706%) or sidewalk (47.647%) was Weeping fig



Mean differences

Variable	Means by group (0 = new; 1 = before 1992)		t-test (one-tailed) p values[1]	t-test unequal (one-tailed) p values[2]	Mann-Whitney p values[3]
pnative_fy (Ha: diff >0)	0	.080438	0.0340	0.0458	0.7185
	1	.0460099			
pnative_sw (Ha: diff >0)	0	.1422628	0.0037	0.0073	0.1187
	1	.0765517			
trees_sw100 (Ha: diff >0)	0	6.489051	0.1363	0.1497	0.3624
	1	5.630542			
sid_fy (Ha: diff <0)	0	.7346939	< 0.001	< 0.001	< 0.001
	1	.8826761			
sid_sw (Ha: diff <0)	0	.5478704	< 0.001	< 0.001	< 0.001
	1	.7514667			

Spatial autocorrelation

Variable	Moran's I by group (0 = new; 1 = before 1992)		Z	p value	Ho: there is zero spatial autocorrelation
pnative_fy	0	0.119	3.777	0.000	Reject
	1	-0.003	0.160	0.436	Not reject
pnative_sw	0	0.052	1.748	0.040	Reject
	1	0.037	2.896	0.002	Reject
trees_sw100	0	0.033	1.313	0.095	Not reject
	1	0.084	6.055	0.000	Reject
sid_fy	0	0.002	0.229	0.410	Not reject
	1	0.046	2.455	0.007	Reject
sid_sw	0	-0.027	-0.523	0.301	Not reject
	1	-0.007	-0.035	0.486	Not reject

Conclusions

- Are newly developed areas planted with more native species? **Ho: Yes**
- Do recently developed areas have more trees? **Ho: No**
- Do recently developed areas have more diversity? **Ho: No**

Future research

- More points and randomly distributed
- Use polygons, but not census tracts instead neighborhoods
- Record tree's age (seedling, young, old)
- Recently developed areas are less diverse this might be the developer's effect, what probably means that the absence of global autocorrelation might be a matter of scale, perhaps reforestation patterns densely sampled at neighborhood scale would show autocorrelation.
- Instead of "natives" it would be better to use drought resistant plants, regardless if they are exotic

Questions?