Hierarchical Spatial Modeling of Multiple Soil Nutrients in Confidence interval of Correlation between Heterogeneous Patches of Land Use Real and Median Predictions: log (Tot N log(Org C) under Hierarchical Spatial, - by Anandamayee Majumdar, Arizona State University **Hierachical Non-spatial, Non-hierarchical Spatial**, and **Non-hierarchical Non spatial** (With Jason Kaye, Corinna Gries, Alexander Buyantuyev, Diane Hope, Nancy Grimm)



Land-use map of Phoenix 2000



Landuse types: Urban residential, Urban non-residential, mixture, Agricultural, Water, Desert etc (8 categories)-**200** samples

Hierarchical Modeling: Used when parameters are connected by some way of the problem. Usually when one wants to model latent processes. In our problem, we use hierarchy as a way to reduce dimensionality of the multivariate spatial structure.

Real and Predicted Surfaces of log(Tot N) and log(Org C)





Dependent variables: Tot N(TN), Organic C(OC), Inorganic C(IOC), Phosphorous(P)

Include a host of bio-physical and socio-economic covariates

Default prediction surface for total Nitrogen



Total N, g/sq m 45.984001 - 47.423050 47.423050 - 48.194145 48.194145 - 48.607327 48.607327 - 49.378422 49.378422 - 50.817471 50.817471 - 53.503082 53.503082 - 58.515083 58.515083 - 67.868683 67.868683 - 85.324760 85.324760 - 117.902000

8.999712 - 9.071843

9.071843 - 9.108264

9.108264 - 9.126654

9.126654 - 9.135940

9.135940 - 9.154329

9.154329 - 9.190750

9.190750 - 9.262881

9.262881 - 9.405737

9.405737 - 9.688662

land-use, 0-1 variable whether ever in agriculture, %lawn, % impervious area, elevation multiple regression, ANOVA, no **Multivariate Spatial structure**, attempt to integrate all land-use or patial structure, no attempt to model ssociation of soil nutrients, no issue f prediction or model comparison prediction at new points.

> we generated values at 5000 new points. The surface maps are







Models







10 20 40 Kilometers





es met in our model:

Heterogeneity of land-use patches, dimensionality, model comparison, missing data layers needed for

Organic C, g/sq m

305.725006 - 322.078430
322.078430 - 330.093933
330.093933 - 334.022675
334.022675 - 342.038177
342.038177 - 358.391571
358.391571 - 391.756165
391.756165 - 459.827332
159.827332 - 598.707642
598.707642 - 882.054199
382.054199 - 1460.14404

49.847229 - 152.078400
52.078400 - 153.273956
53.273956 - 153.914566
53.914566 - 154.257843
54.257843 - 154.898453
54.898453 - 156.093994
56.093994 - 158.325180
58.325180 - 162.489090
62.489090 - 170.259964
70.259964 - 184.762283
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