Plant Distribution in a Sonoran Desert City

CAP LTER Data Explorations

Author: Ecology Explorers Team, adapted from data analysis by J. Walker and the CAP LTER 200 point survey
Time: 15-30 minutes
Grade Level: 9-12

Background:
The Phoenix urban core is composed of several contiguous cities and is situated within the Sonoran Desert. This area is being studied by scientists as part of the long-term ecological research network (LTER) funded by the National Science Foundation. Our project, the Central Arizona-Phoenix LTER (CAP LTER) is focusing on researching the effects of urbanization on the surrounding desert ecosystem and vice versa. The Phoenix area is growing rapidly with a population with 300,000 people in 1950 and 3 million+ in 2005. The area receives annual precipitation of 180 mm (6 inches) and can experience summer temperatures as high as 48 C (115 F). The rain comes twice a year (winter & summer), which contributes to the high species diversity of the Sonoran Desert as compared to the North American deserts. Urbanization of this area has led to decreased agricultural development (formerly focused to the west, south, and southeast of the urban core) and increased water control via dams, reservoirs, and canals.

Objective(s):
Students will analyze patterns of native and non-native plant distribution across metropolitan Phoenix.

Standards:
Science

Advanced Preparation:
Students should have been introduced to basic information about population and community ecology.
Student should have been introduced to the terms “native” and “non-native”

The data presented here are called Krig maps which are based on data taken at specific geographical locations and statistical analysis of these data using a computer model. This model is called “Kriging” (a type of interpolation) and it predicts what areas around and between the sampling points might look like. Using this type of model, scientists can look for patterns across a larger area based on the data from their randomly selected sampling sites. This type of graph (map) includes both the actual measures (in this case plant species abundance) at each sampling site and also the predicted number of plant species between the sampling sites. Red indicates highest densities (abundance) and blue the lowest.

Materials:
Student Worksheets

Evaluation:
Observation during the activity and participation in discussion
Student responses to reflection questions

Extensions:

Have students conduct their own studies of plant distribution on campus, at home or in the desert following the Ecology Explorers Plant Protocol (http://ecologyexplorers.asu.edu).

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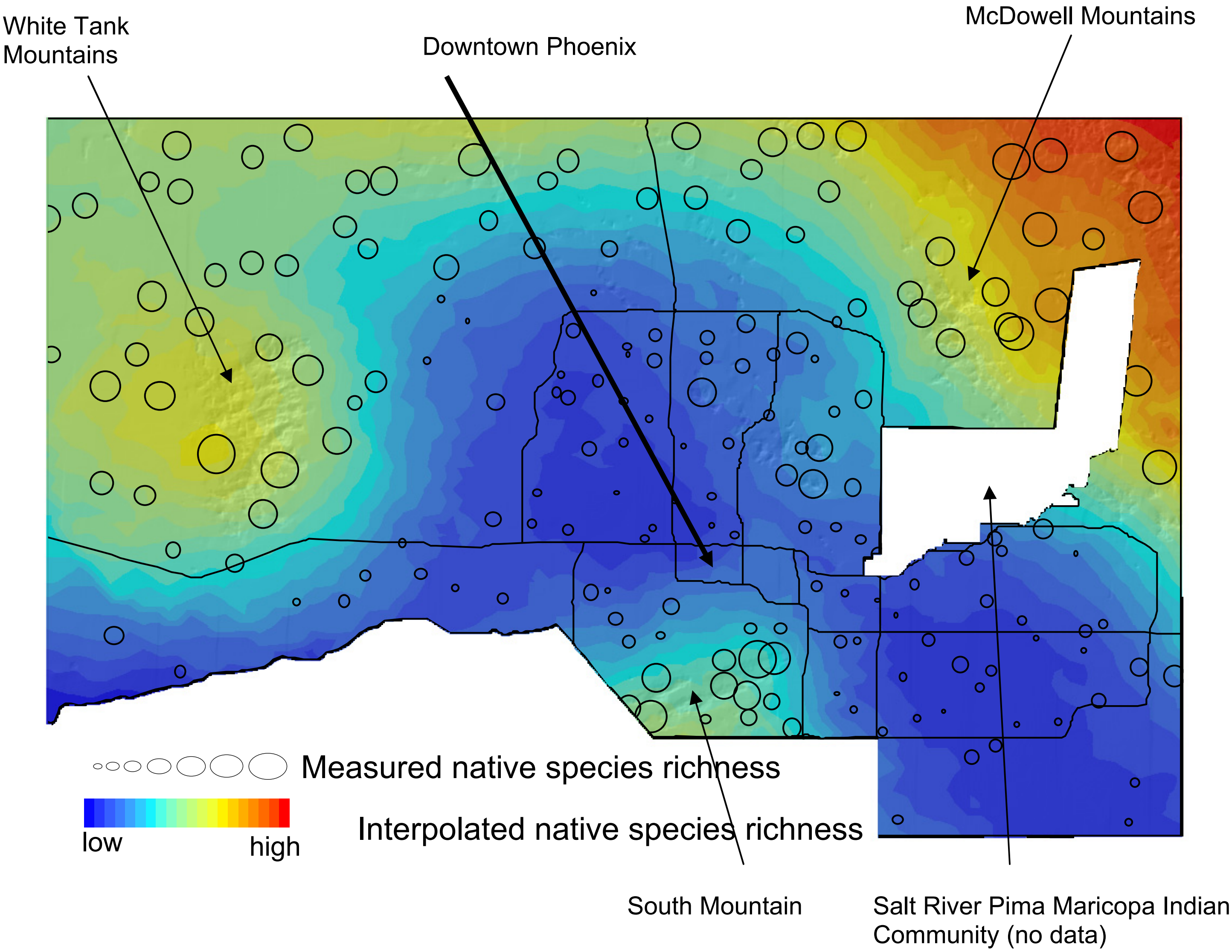
Native Plant Distribution (Graph 1).



The circles represent actual plant survey sites. The larger the circle the more native plant species (native richness) were found there. The colors indicate what the plants around each of the sampling sites would probably look like, so in this case red means more native plant species and blue means fewer native plant species.

1. Where do you find the most native plant species? In downtown Phoenix or in the McDowell Mountains?

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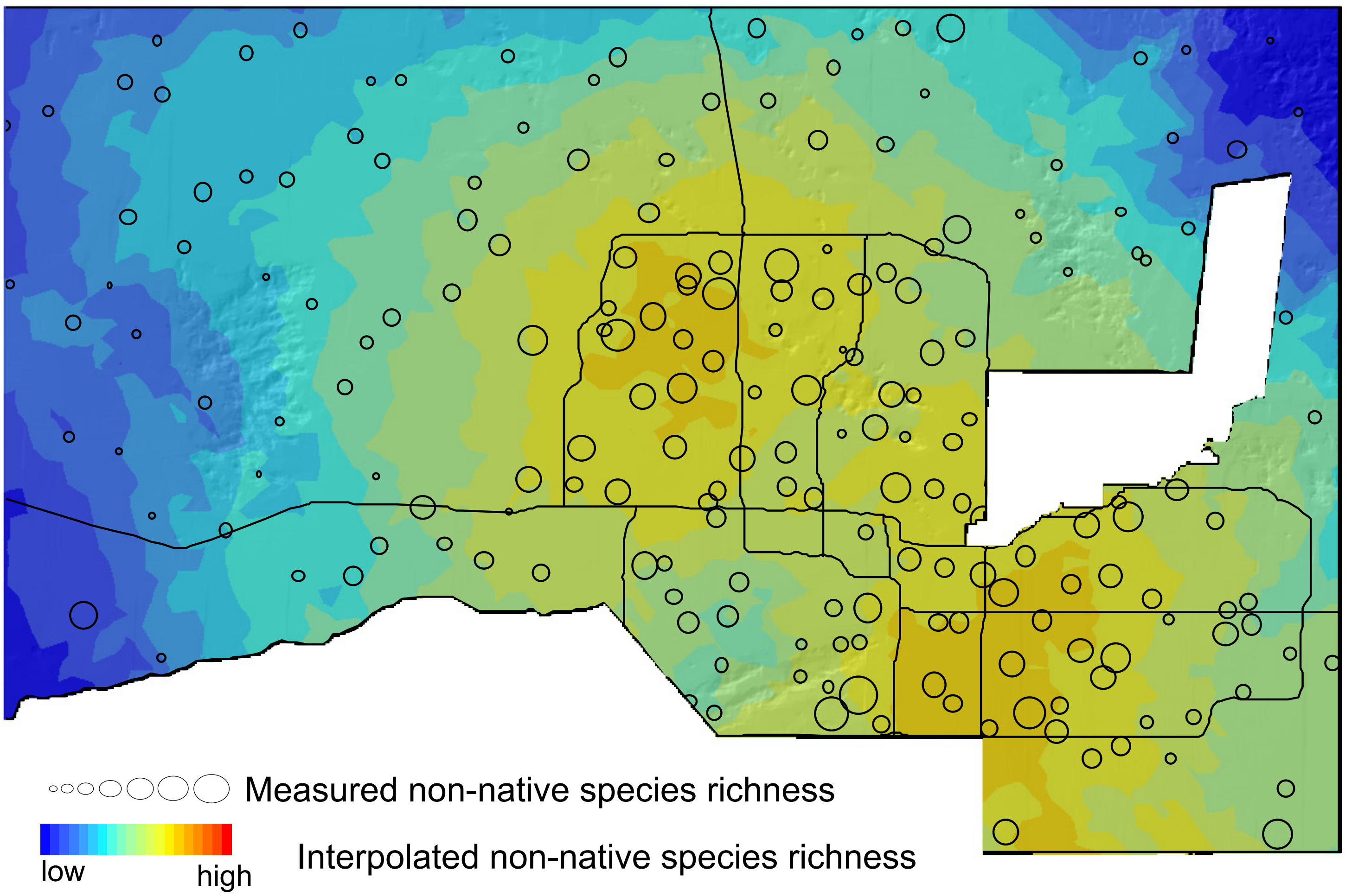
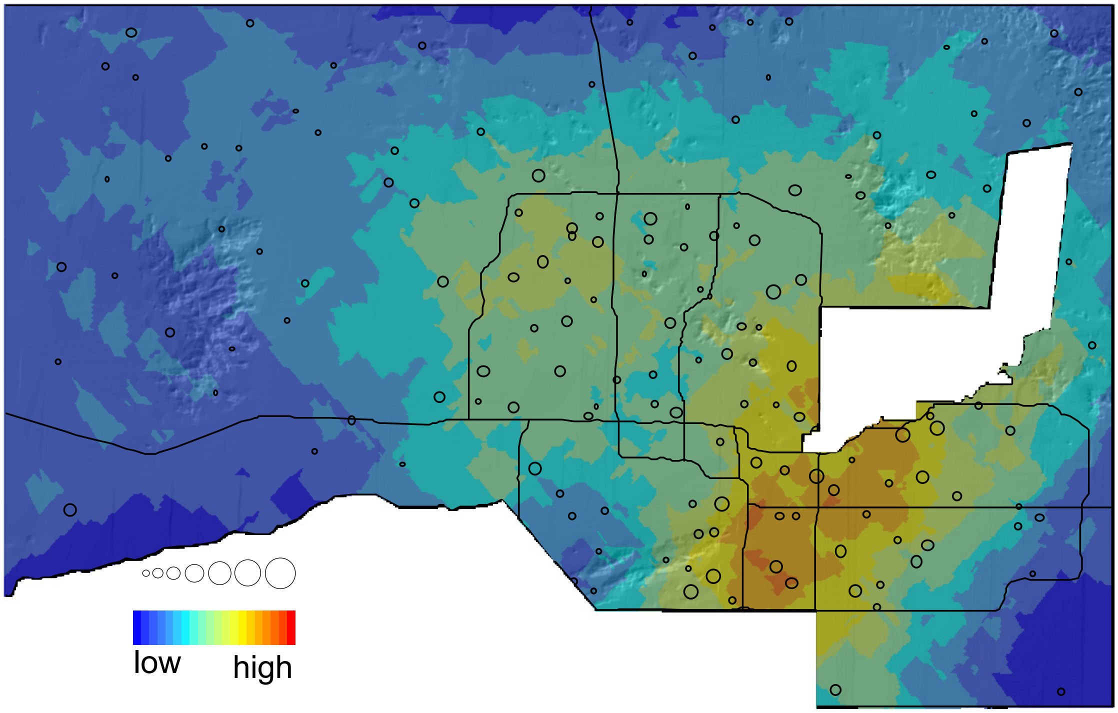
Non-native Plant Distribution (Graph 2)

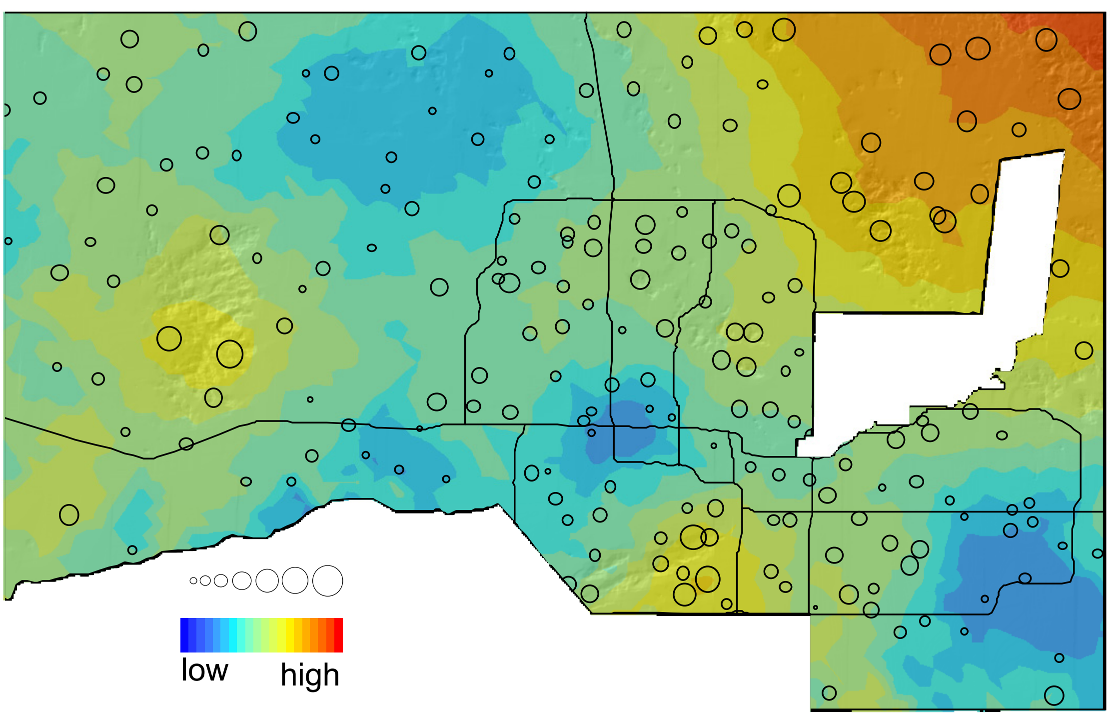


Richness is a term used by ecologist to indicate how many different species are in a particular area. High richness means many different species, while low richness would indicate very few different species.

Tree Richness (tree species diversity) (Graph 3)



Shrub Richness (shrub species diversity) (Graph 4)



Questions:

2. Looking at Graph 2, where do you find the most species diversity of non-native plants? The city or the desert?

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3. When you compare the maps for tree richness and shrub richness (Graph 3 and 4) try to find a pattern you didn't expect and describe it. What about it is surprising?

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4. How might the distribution of native and non-native plants across the Phoenix area impact insect and animal distributions?

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5. How might the patterns in these maps reflect landscaping preferences by people?

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6. Based on the CAP LTER analysis of plant in neighborhoods, scientists have noticed that the average number of trees around a home in Phoenix is three. How many are around your home?____________ Why do you have (or do not have) trees?____

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