Species distribution

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Methods

Species Information

The Saguaro cactus (*Carnegiea gigantea*) is a columnar cactus endemic to the Sonoran Desert (western Sonora Desert and southern Arizona). It is considered a keystone species because of how many species rely on all the different life stages of the plant for food, nesting, shade, etc (Drezner, 2014). There is increasing fears of population collapse because of invasive grass species which are encouraging a fire regime which Saguaro cacti did not evolve to experience. As the climate warms, and grasses invade, saguaro cacti populations are expected to decline (Hauser, 1993),(Marshall *et al*, 2012),(Schiermeier, 2005). Thus, it is critically important to understand the species distribution to inform and direct conservation and restoration efforts.

Saguaro Cacrtus (*Carnegiea gigantea*)

Statistical Analysis

BIOCLIM is an algorithm is a very useful modeling method used for species distribution, especially to teach newcomers. Despite newer models performing better than BIOCLIM, the simplicity and ease of use allow students to hone their skills and grasp otherwise complex modelling. The algorith relies on constraining the similarity of locations to the mean if they are near either tail of the distribution. A transformation is performed by using the value obtained via using the minimum tail, subtracting by 1 and multiplying by 2 to ensure a value between 0 and 1. This is done to enable easier analysis interpretation.

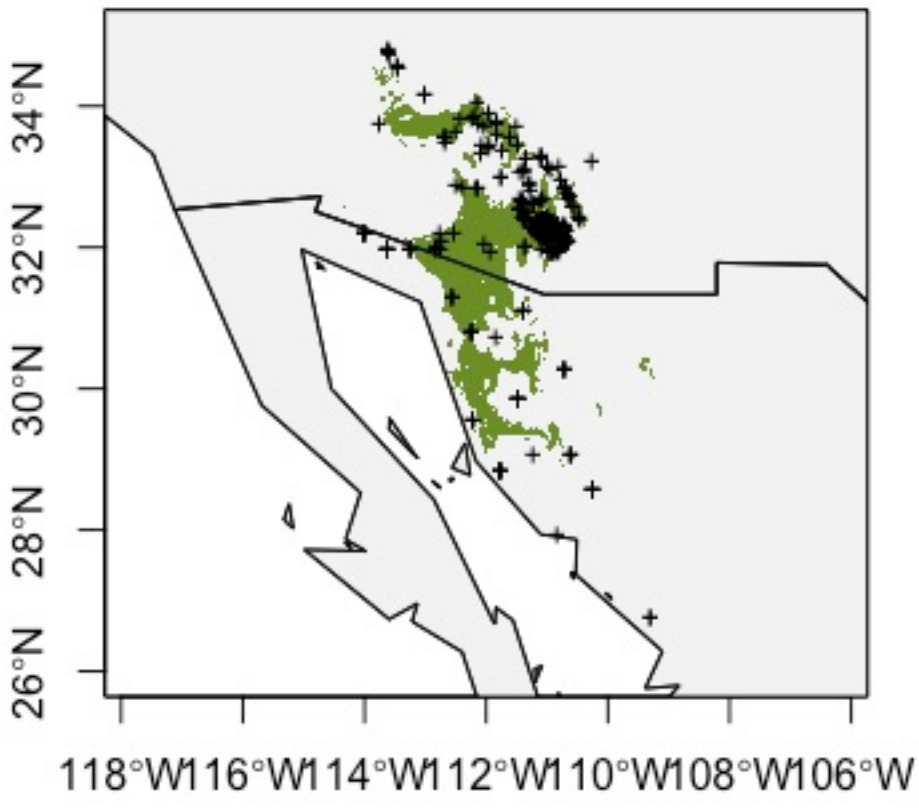

Figure 1: Saguaro distribution

Dependent species

Common.name	Use
Gila woodpeckers	Nests
House Finches	Nests
Gilded Flickers	Nests
Purple Martins	Nests
Elf owls	Secondary nests
Tyrant Flycatchers	Secondary nests
Wrens	Secondary nests
White-wing dove	Eat fruits
Ants	Eat fruits
Honey bee	Eats nectar
Flies	Eats decomposing tissue
Beetles	Eats decomposing tissue

Desert Iguana	eats flowers
Sonora harvest mouse	eats seedlings
Desert kangaroo rat	eats flowers and seedlings
Gray Fox	eats fruit
Jack rabbit	fruit
Vulture	Roosting perch
Humans	eat fruit and seeds, water vessel , use as feed

Table 1: List of some common species which depend on Saguaro cacti and what it is that they use them for. Not an exhuastive list. Information pulled from (Drezner, 2014), except human uses.

Discussion

A model showing the distribution of Saguaro cactus (*Carnegiea gigantea*) was created in R studio by using occurance data (GPS points of where the species has been recorded) and environmental data (19 abiotic factors). The model used occurance points as well as pseudo-absence points coupled with BIOCLIM data which factored 19 abiotic variables including various temperature and precipitation parameters (max, min, mean, etc) into the model to not only map the occurance, but also predict where other individuals are likely to exist. This mapping distribution could be very useful to managment officials and researchers who continue to monitor the effects of invasives, as well as monitoring the health of the Sonoran desert by using the keystone species Saguaro cactus as a proxy. While various methods have been developed to more accurately map species distribution, this method is a great starting point to teach young scientist how to code and analysis species distributions.

Works Cited

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