The Study
As the population of the Phoenix Metropolitan area grows, increasing temperatures have been found to have significant impacts on human health and environmental systems. Building upon the work of Meehl et al. (2004), this study analyzes the annual number of frost, and misery days recorded at the Phoenix regional weather station for the complete historical temperature record.

Frost days defined: nighttime minima temperature < freezing (32°F). Frost days help regulate pest and disease outbreaks by maintaining seasonal breeding cycles.

Misery days defined: daily maximum temperature ≥ 110°F. Misery days have adverse impacts on human health and well being as well as economic and environmental systems.

- What are the annual and decadal number of frost days and misery days for the Phoenix regional weather station between 1896-2009?
- If threshold temperatures are increasing, what environmental and social tradeoffs should be addressed?

Research Methods and Data

Study Area
The Phoenix metropolitan area is located in the Southwestern United States. The large-scale population growth and urbanization of metropolitan Phoenix has been a mixed blessing: while growth has provided a valuable economic base for the city, the transformation of the fragile Sonoran Desert ecosystem into an urban metropolis has resulted in significant changes in regional temperatures, which, in turn, present serious risks and challenges to the health and well-being of local residents.

Metropolitan Phoenix

Data
The data was provided by the Arizona State Climate Office and reflects temperature readings taken from the Phoenix weather station (operational from 1895-1999) as well as the weather station at Sky Harbor International Airport (1930-Present).

Methods
Daily temperature readings were collected from the Arizona State Climate Office. A literature review was conducted to define appropriate threshold temperatures for frost days and misery days. The temperature data was then organized to reflect the amount of threshold temperatures occurring each month. Finally, the amount of frost days and misery days were summarized per year, and per decade. The data has been represented in graphs and tables to depict the historical temperature trends in Phoenix from 1896-2009.

Analysis of Frost and Misery Days
The analysis of frost days and misery days by decade shows two distinct patterns.
2) A pronounced departure from historical temperature patterns beginning in 1970 extending to present.

Conclusions
1. Frost/misery day analyses show: a) natural temperature variability from 1896-1970; b) a significant decrease in the number of frost days beginning in 1970; and c) a significant increase in the number of misery days beginning in 1970.
2. The substantial warming trend beginning in 1970 corresponds to the large-scale urban growth which occurred throughout metropolitan Phoenix.
3. Reflecting on the findings and literature used in this study, native plants in the Sonoran Desert may be negatively impacted as they rely on frost days for species dispersal; (see future research).

Future Research
1. Identify mitigation strategies to help reduce anthropogenic impacts on natural systems.
2. Maximize the efficient use of local resources (e.g., water, energy).
3. Use a rural neighborhood to conduct a similar study that investigates the evolution of the Urban Heat Island in Phoenix, AZ.

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