J1.5 A CASE STUDY IN RESORT CLIMATOLOGY OF PHOENIX, ARIZONA, USA

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1. INTRODUCTION

Tourism is Phoenix, Arizona, USA's second most important industry, bringing in over $5 billion annually, and it is supported through more than 45,000 hotel rooms and over 190 golf courses.

"*We have high standards for our weather here in Phoenix. Each year we demand at least 300 days of sunshine-and get it. We also order up low humidity, along with mild temperatures throughout the year that average a balmy 72 degrees (22.2°C). But don't take our word for how nice it is, come see Phoenix for yourself.…Winter in Greater Phoenix means perfect weather for golf, outdoor fun, sporting events, poolside dining or whatever fits your fancy. Escape to the spectacular Sonoran Desert, where world-renowned resorts and spas await you."* (GPCVB, 2003).

Tourism in metropolitan Phoenix is partially weather dependent. For places like Miami, Florida and Phoenix, the high season occurs during winter months, and on the spring and fall shoulders of the hot summer season (Scott and McBoyle, 2001 – see Fig. 1).

We received permission from several resorts to install small unobtrusive weather stations. Usually, temperatures collected by the National Weather Service provide tourists with climate information, but this information may not be an accurate reflection of the regional and microclimate conditions that exist at resorts in the metropolitan area. Thus, this paper explores the regional thermal and human comfort variability "away from" the central standard first order weather station of Sky Harbor International Airport in central Arizona.

2. METHODS

We conducted a short field project (as part of a spring term research methods geography course) which led us to expanding this paper topic. For the period March 24-April 1, 2001 we sampled seven resorts spread out in and around the metropolitan area. The centrally located airport temperatures and even dew points were higher than at the resorts (see Fig. 2). There were considerable humidity differences among the mesic/oasis resorts (equivalent to or less than the airport) vs. the xeric type resorts (lower dew points than the airport).

3. COMFORT MODELING

To evaluate comfort at the different kinds of sites on a year round basis, we made use of a recent model called OUTCOMES – *OUT*door *COM*fort *E*xpert *S*ystem - (Heisler and Wang, 2002) which estimates the energy budget of a cylindrical person given weather data from a site, and a site's surrounding radiative and thermal environmental fluxes – a function of vegetation, landscaping, shade, moisture, etc. We selected one xeric resort (on the urban fringe) and one mesic resort for which we could choose a nearby historical weather station representative of local weather at these resorts in order to model comfort on case days for the airport and these two sites around the calendar year. Two AZMET (Arizona Meteorological Network) sites were chosen by comparing our short sample of days for these two resorts to the AZMET sites most closely correlating to the resort (see Fig. 3). From the year August, 2002 to July 2003, we chose typical days close to each mid-month period that were near to that month's mean daily temperatures and accessed hourly weather data for those dates from the AZMET archives.

4. RESULTS

As expected, the OUTCOMES modeling showed substantially shorter durations of comfort at the airport and longer periods of comfort at the resorts, especially for the mesic resort. Also, resorts on the urban periphery, at higher elevations, such as the xeric resort, are more comfortable than urban exposed-site data would suggest. A primary reason for this is the heat island effect in the core of the metropolitan area, and also elevational cooling and more wind. The comfort season is longer than inferred by the airport records; or conversely, for places over exposed urban surfaces, longer discomfort occurs on the "shoulder" times of year near the hot summer season. Comfort times are

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increased, for urban dominated surfaces in three-dimensional building settings, unlike the sun-exposed airport site. And resort shade and evaporative cooling effects on comfort are realized to a significant degree for warmer months, when the airport data indicate very uncomfortable conditions. The Phoenix landscape is a mosaic of moist and dry surface conditions, unlike some traditional desert cities with little heterogeneity of land covers (Jenerette and Wu, 2001). It should be emphasized that in winter there is slightly more discomfort at the cooler resort locations, but choice of clothing is more easily handled at these times and rarely do temperatures reach freezing.

Ostensibly, with uncertainty of increasing regional temperatures, rapidly rising Arizona populations, and issues of water use on the horizon for the Southwestern United States, plus possible increased urban temperatures on the shoulders of the uncomfortable summer season (e.g., Brazel, 2003), it could very well be that future conditions could further limit the fall and spring outdoor comfort in the region. This might have a potentially large economic impact for the Valley of the Sun on tourism on the “shoulder” times of the year. In this case, it might be even more important to highlight the resort comfort differences from standard airport values and to establish indices of comfort on a regional basis. A full assessment of optimal future scenarios of climate effects on resorts seems warranted to plan for maximizing benefits for resorts and maximizing outdoor comfort for its patrons.

5. REFERENCES

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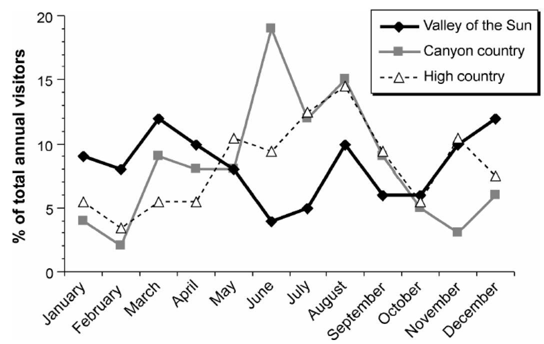

Fig. 1. Seasonal visitors pattern. Valley of the Sun is the Phoenix area.

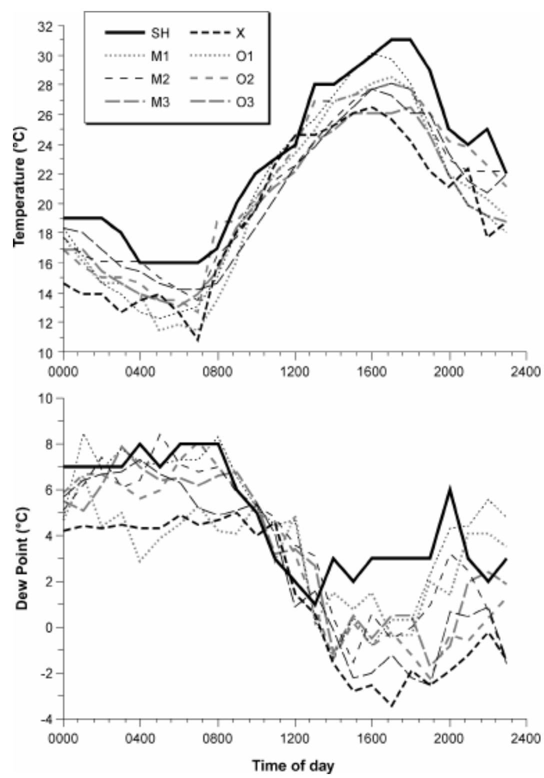

Fig. 2. March 28, 2001 sample day of temperature, dew point at several resorts (M=mesic; O=oasis; and X=xeric types). SH = Sky Harbor Airport.

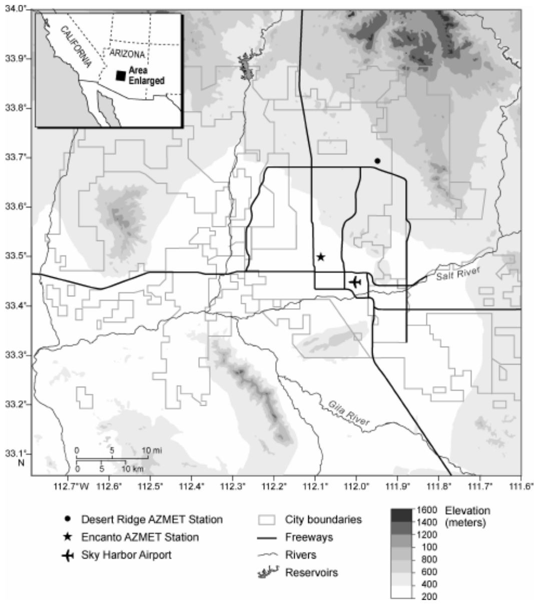

Fig. 3. Location of two AZMET sites close to resorts, plus Sky Harbor Airport in central Phoenix, AZ, USA. Note increase in elevation to east and north.