How FLAGSTAFF is preserving DARK SKIES

A star party and world-leading community are keeping the hometown of Lowell Observatory in the dark.
by Christian Luginbuhl and Jeffrey Hall
FLAGSTAFF, ARIZONA, WRAPS picturesquely around the base of the San Francisco Peaks, the state’s highest mountain range. At an elevation of 7,000 feet (2,130 meters), the air is thin, and nights are chilly even in summer. The bracing environment, however, doesn’t stop thousands of people from coming every September to Buffalo Park, a large open space right in the middle of the city, to peer into the cosmos.

Here at the Flagstaff Star Party, rows of telescopes are hosted by the area’s many amateur astronomers, as well as by professionals from Flagstaff’s two major observatories: Lowell Observatory and the United States Naval Observatory (USNO). Despite the location less than 2 miles from City Hall, the sky is spectacular. The astronomers trace constellations and stars fainter than 6th magnitude for the partygoers, and the autumn Milky Way rises from the looming peak of nearby Edden Mountain, arca through the zenith, and dives into the southwestern horizon directly over the center of the city. Even the splendid Sagittarius star clouds find little competition from the sky glow.

The Flagstaff Star Party bills itself as “The World’s Most Accessible Dark Sky Star Party,” a unique event providing easily accessible viewing under unexpectedly dark skies, within a 10-minute drive of restaurants, hotels, and all the amenities of a college town of 70,000 inhabitants. To the quantitatively inclined, the event boasts Bottle class 4 skies, a zenith sky brightness fainter than 21.2 magnitudes per square arcsecond, and a zenith limiting magnitude of 6.5 or fainter. (The Bottle scale is a nine-level scale of sky darkness created by astronomer John Bottle in 2001. Bottle 9 is a terrible, urban sky, and Bottle 1 is a perfect sky with no terrestrial lights.) All of this stems from a 59-year tradition of dark-sky preservation in Flagstaff, which in 2001 was given the first "International Dark-Sky City" designation by the International Dark-Sky Association (IDA). Flagstaff shows in brilliant highlights just what can be achieved.

Preserving dark skies for astronomy — and more

Dark-sky protection in Flagstaff goes back to 1958, when at the impetus of Lowell and USNO astronomers, the city enacted the world’s first law to protect night skies, banning advertising searchlights. Lowell (established in 1894) and USNO (1955) steadily grew, and they now have over $145 million in telescope assets in the area. Preservation of the sky quality necessary for astronomical research is contained in Flagstaff’s lighting code and in its engineering standards. At the heart of these standards is a proverbial three-legged stool for dark-sky preservation: full shielding for outdoor fixtures, limits to the total amount of installed lighting per acre, and spectrum management calling for low-pressure sodium street and area lighting. Astronomy, however, is only part of the equation. Flagstaff has built the idea of looking up and seeing a star-filled sky into the city’s culture. You can find locals stargazing at the "dark-sky mocha" at Late for the Coffee, or unwinding at the end of the day at Dark Sky Brewing Company on Beaver Street. A bit west of downtown, you can turn off Flagstaff Ranch Road onto Dark Sky Lane. The IDA proclamation of dark-sky city status is found on signs leading into town. The natural night sky — as an environmental quality, as a resource to be enjoyed, as a tourism driver, and as an ecological and health benefit — is part of the ongoing conversations of residents, city planners, and advocacy groups like the Flagstaff Dark Skies Coalition.

Decades ago, we all had to think consciously about whether refuse went in the trash or the recycle bin, today it’s second nature. For a longtime resident of Flagstaff, it’s startling to go to another city and not see the Milky Way from downtown. Seeing it’s startling to go to another city and not see the Milky Way from downtown. Seeing the galaxy and faint stars from the middle of a sizable town is second nature. Unfortunately, it is also easy not to see them unless preserving the dark sky also becomes second nature.

Losing the night

The night sky has been a canvas of human hopes and inspirations since we have been aware enough to raise our eyes from the ground. Yet today, we find night’s window closing almost everywhere, veiled by the spread of artificial light. Sensitive individuals noticed this invasion long ago. In 1829, naturalist Henry Beston lamented, “With lights and ever more lights, we drive the holiness and beauty of night back to the forests and the sea” (The Outermost House). But in our modern age, the problem has vastly accelerated, with an ever-increasing demand to use more light in more circumstances and at more times. “The New World Atlas of Artificial Night Sky Brightness” (available online at http://advances.sciencemag.org/content/2/6/e1600377), published in the June 2016 issue of Science Advances, revealed in beautifully-colored maps the un-beautiful consequences of increased artificial light. None of the land area in Europe or nearly anywhere east of the Great Plains in the United States has naturally dark night skies, 60 percent of Europeans and nearly 80 percent of U.S. residents live where they can no longer see the Milky Way. Increases in the efficiency of lighting technologies (most recently LEDs), always touted as an opportunity to save energy, have instead only contributed to the relentless increases in the amount of light. How many of us know that this is not necessary?

Recovering the night

It doesn’t have to be this way. To examine the options, we return to our three-legged stool.

Shielding. Use of fully shielded fixtures, ensuring no light radiates above horizontal, is simple and effective. Flagstaff does it, other dark-sky communities do it, anyone can do it. Even absent any other

SENSIBLE DARK-SKY LIGHTING STANDARDS WOULD REDUCE SKY BRIGHTNESS OVER OUR CITIES BY 90 PERCENT OR MORE.

The energy efficiency of lighting varies widely, from the highly efficient (white LED and low-pressure sodium) to the less efficient (phosphor-converted amber and narrow-band amber LED), to the woefully inefficient (incandescent).

Spectra of common outdoor lighting types show narrow emission from low-pressure sodium, at bottom, which does little to interfere with night sky viewing. On the other hand, broad spectrum LEDs, at top, emit light over a wide range of wavelengths, making them destructive to skywatching.
appropriately regulated, it can be done. Light pollution is a matter of priorities, not of geography.