Artificial Night Lighting and Protected Lands: Ecological Effects and Management Approaches – Errata

Figure 2. This figure has an error in the indicated illumination levels from the quarter moon. Because the figure is reprinted with a slight modification from another source, we investigated the origin of the error to correct the record.

A quarter moon, technically, is half of the disk of the moon illuminated, which is one quarter of the entire moon. The icon used for the “quarter moons” in the figure, however, is that of a crescent moon, where closer to one quarter of the disk is illuminated. We switched the icon for the “quarter moons” from a depiction of three quarters of the disk illuminated to one quarter of the disk illuminated to match this commonsense language. The line actually depicts the light levels from a three-quarters illuminated moon that was incorrectly labeled as being the illumination from the “quarter moons” in Beier (2006). Beier (2006) adapted the graphic from McFarland et al. (1999), who cite their sources as Blaxter (1970) and Brown (1952). The error was introduced by McFarland et al. (1999), who correctly copied the illumination line for a three-quarters illuminated moon from Brown (1952) but incorrectly labeled it as “quarter moons.”

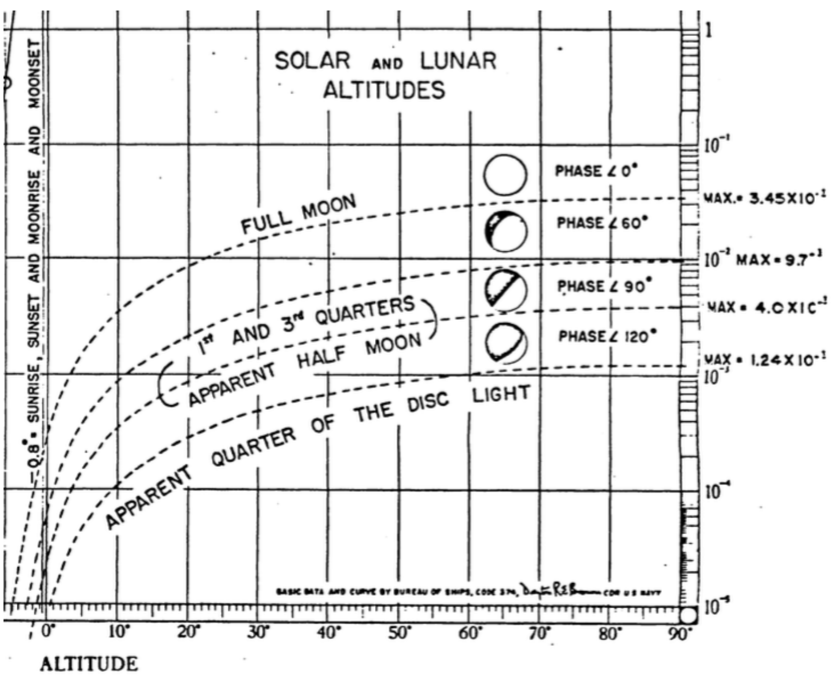

Figure E1. Illumination produced by the phases of the moon reported by Brown (1952). The text “1st and 3rd Quarters” indicates the “apparent half moon.”

The 1952 Brown report provides curves of illumination from the moon at four phases: full (phase angle 0º), three-quarters full (phase angle 60º), half full (phase angle 90º, which is technically a “quarter moon”) and one-quarter full (phase angle 120º) (Figure E1). In the McFarland et al. diagram, two curves are given: one for the full moon and one for “quarter moons” (Figure E2). The full moon line is correct. The “quarter moons” line is the same as the three-quarters full moon in Brown (1952), meaning that the lunar disk is three-quarters illuminated (phase angle 60º) and not a “quarter moon” in the sense of one quarter of the disk being illuminated or even a quarter moon meaning one quarter of the entire moon visible and illuminated (half of the disk visible and illuminated). This error was carried forward in Beier (2006) and repeated by Gaston et al. (2014), who also changed the icon to a crescent moon (Figure E3) and in Figure 2 in this document.

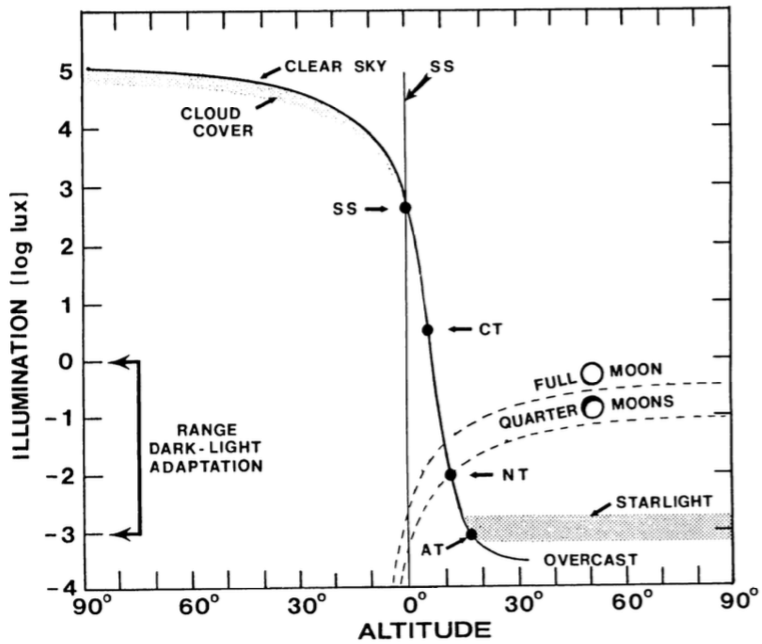

Figure E2. Illuminations produced by the sun and moon as reported by McFarland et al. (1999). Note that “quarter moons” identifies the same line as a three-quarter moon in Brown (1952) once the conversion from footcandles to lux is made.

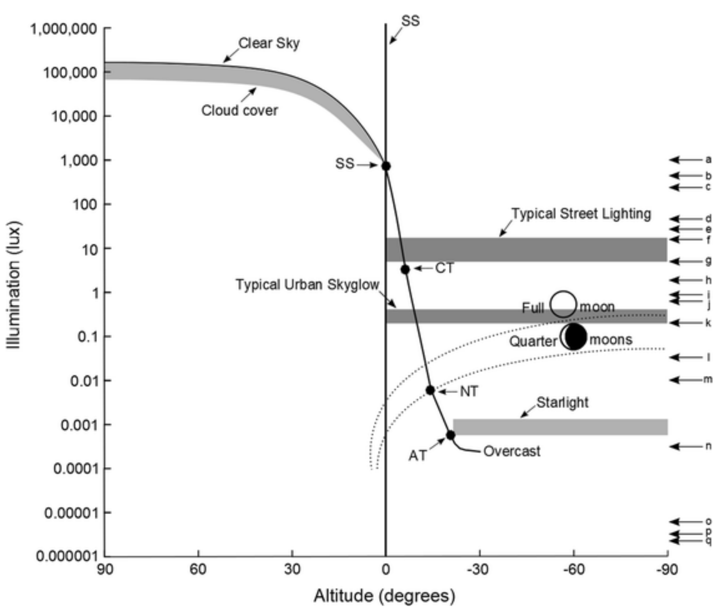

Figure E3. Illumination from the sun and moon reported by Gaston et al. (2014). The curve for the “quarter moons” is shifted downward slightly but is an order of magnitude higher than a crescent moon (a quarter of the face illuminated) and higher than a quarter moon (half of the face illuminated).

We apologize for not catching the confusing language in the diagram when we edited Beier's (2006) chapter, and for replicating the error in the figure. In reprinting it, we switched the diagram for a three-quarter illuminated moon, which was actually correct but improperly described in the text, for a crescent moon (one-quarter illuminated).

For the record, the approximate values for the maximum clear-sky illumination from the moon directly overhead at its phases are as follows.

	Phase Angle	**Brown (1952) (lux)**	**(Krisciunas & Schaefer 1991) (lux)**
Full 100% illuminated	0º	0.37	0.423
Gibbous 75% illuminated	60º	0.10	0.071
First and Last Quarter 50% illuminated	90º	0.043	0.028
Crescent 25% illuminated	120º	0.013	0.008

These values can vary based on the distance between the sun and the moon and whether the moon is waxing or waning because of the differing characteristics of the face of the moon. Illuminations this high are unlikely to occur under most circumstances, especially at temperate latitudes and a working estimate of illumination from the full moon is closer to 0.1 lux on the ground than the ~0.4 lux potential maximum illumination.

Page 3. We describe the changing spectral composition of light at dusk in a way that deserves elaboration to avoid confusion. We stated that airglow and zodiacal light contain more red than daylight. As a proportion of the light emitted from airglow, this is true. To elaborate, airglow is dominated by green light. Zodiacal light is reflected sunlight and will track its spectral composition quite closely and is very slightly shifted to the red (Leinert et al. 1998), but so little that it may not have any ecological relevance.

Page 22. We described the correlated color temperature (CCT) of a number of different light sources. Calculation of correlated color temperature for light sources that are not on the black body curve is difficult. We provided the wrong CCT for high-pressure sodium lamps, accidentally providing an estimated CCT for low-pressure sodium lamps. We remain skeptical of the calculation of a color temperature for a light source with a single wavelength. To complement our brief description, here are color temperatures of different lamp types as reported in the literature and measured in the field.

Incandescent bulb	2604–2709 K (Elvidge et al. 2010)
Low-pressure sodium vapor	1807 K (Elvidge et al. 2010), 1740 K (Thorington 1985)
High-pressure sodium vapor	2056–2105 K (Elvidge et al. 2010), 1900 K (fluxometer.com)
Metal halide	2874–4160 K (Elvidge et al. 2010)
Sun	3000–30,000 K, but usually 5200–6000 K (Thorington 1985)

We thank Andrej Mohar for noticing and letting us know of the errors and ambiguities corrected here.

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