An Oregon Resident's 21 August 2017 Solar Eclipse Account

Introduction

As illustrated in Figure 1, the 21 August 2017 solar eclipse cast a path of totality about 100 km wide spanning the contiguous United States from northwest to southeast.

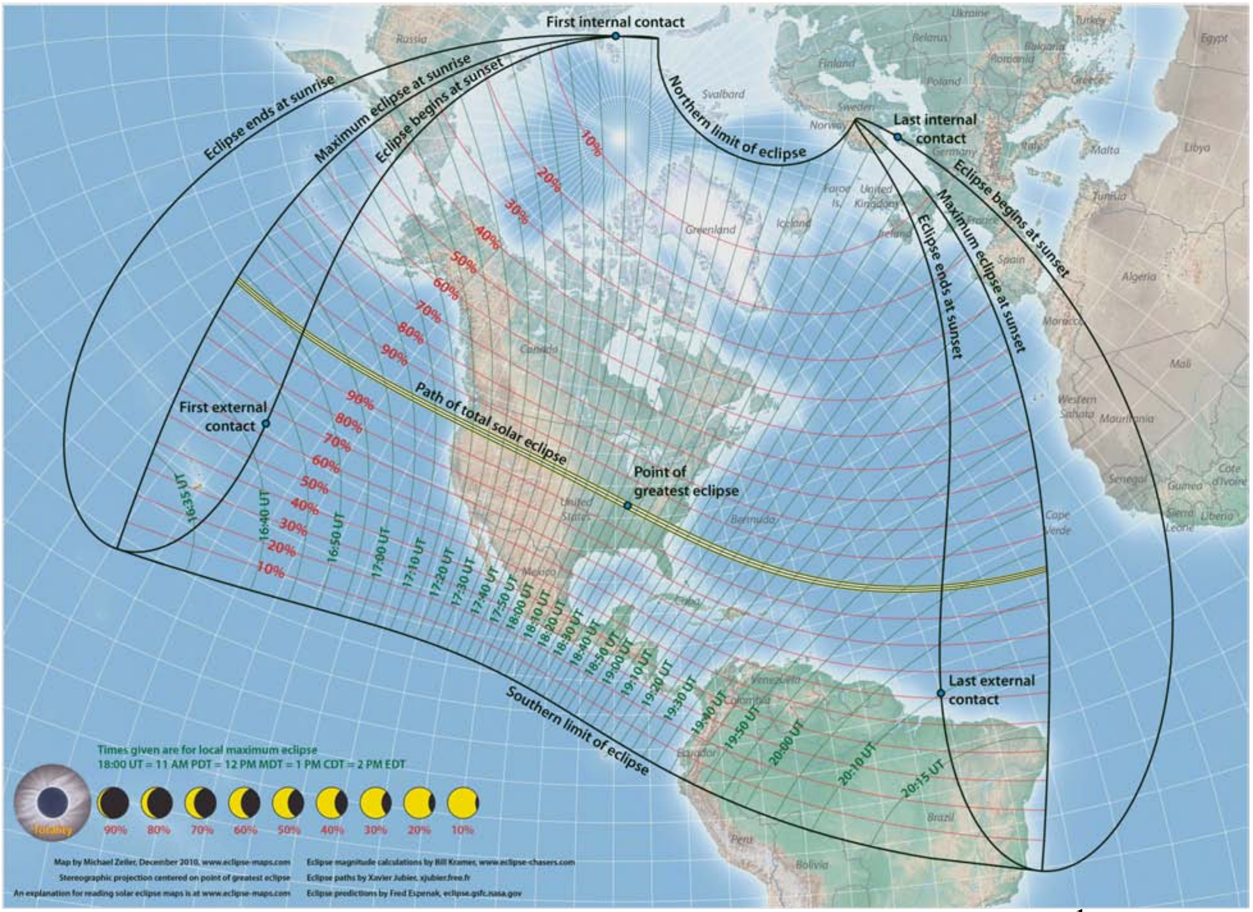

Figure 1. The total solar eclipse of 21 August 2017 is summarized by a graphic[1] in which green contours and annotations indicate the Universal Time (UT) of maximum solar eclipse. The path of totality reaches the coast of Oregon by 17:17 UT and is departing the coast of South Carolina 90 minutes later at 18:47 UT.

This account relates eclipse experiences from the perspective of author Dan Adamo, his wife Susan, and guests visiting their property located south of Salem, Oregon. Precise GPS-derived observing site coordinates for the account are 44° 50' 20" N Latitude, 123° 05' 18" W Longitude, and 268 m Altitude. Local time at this location on 21 August is Pacific Daylight Time (PDT), where PDT = UT - 7 hrs. To convey an appreciation for events in this account as they relate to their Salem perspective, subsequent observation times are therefore given in PDT. Major eclipse events for the observing site appear in Table 1.

[1] Reference http://eclipse-maps.com/Eclipse-Maps/Gallery/Pages/Total_solar_eclipse_of_2017_August_21_files/Media/TSE2017_stereographic/TSE2017_stereographic.jpg (accessed 23 August 2017).

Table 1. Eclipse circumstances on 21 August 2017 are summarized for this account's observing site near Salem, Oregon[2]. In the table, Elevation is the angle between the Sun's center and the local horizon point below it, while Azimuth is the angle from true north measured eastward along the local horizon to this sub-solar point. From this observing site, the Sun is to some degree eclipsed for 2 hrs 32 min 25 s, and it is totally eclipsed for 2 min 2 s.

Event	AM PDT	°Elevation	°Azimuth
Eclipse Begins	09:05:17	27.7	101.2
Totality Begins	10:17:08	39.8	116.7
Totality Ends	10:19:10	40.1	117.2
Eclipse Ends	11:37:42	51.0	140.0

Eclipse Observing Conditions

As illustrated by Figure 2, sunrise on 21 August 2017 was observed over terrain in the Cascade Mountains at 6:27 AM. Only dissipating stratospheric contrails and forest fire smoke in the vicinity of Mt. Jefferson (slightly beyond the right edge of Figure 2) marred otherwise clear skies. Smoke obscured Mt. Jefferson during the entire eclipse, but it otherwise had no discernable impact on eclipse observations.

Figure 2. Sunrise at the observing site on 21 August 2017 is captured in this panoramic image from Marilyn Schad. Horizon terrain is in the Cascade Mountains. Mt. Hood, whose summit is 124 km distant, is visible at left.

Light easterly breezes less than 1.5 m/s prevailed at the observing site throughout the morning of 21 August 2017. During the eclipse, temperatures dropped 6.4° F per Figure 3.

[2] These data are generated from observing site coordinates input to Form B at http://aa.usno.navy.mil/data/docs/Eclipse2017.php (accessed 24 August 2017).

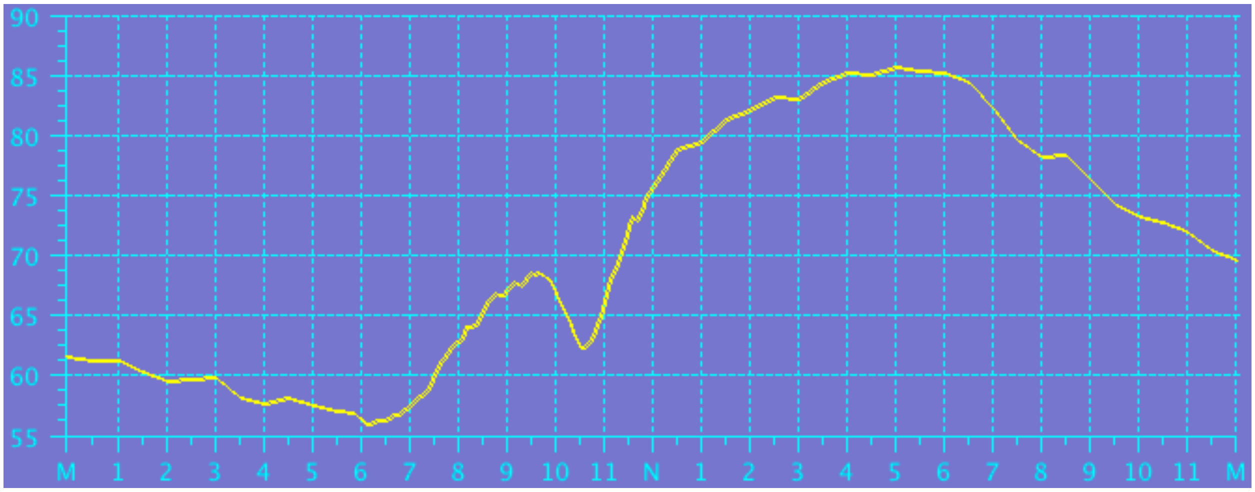

Figure 3. Temperature in °F at the observing site is plotted as a function of PDT throughout 21 August 2017. Note the local minimum of 62.4° F at 10:35 AM about 15 min after the eclipse's total phase has ended. Sensor data are produced by a Davis Vantage Vue 6250 wireless weather station using accessory plotting software. Data logging frequency is generally 30 min but is reduced to 5 min from 5:50 AM to 11:50 AM PDT.

Guests at the observing site hailed from next door to as distant as Texas. Their presence at the observing site is illustrated in Figure 4.

Figure 4. Observing site guests finish arriving about 9:55 AM PDT, 22 min before the eclipse's total phase begins. Note the deepening blue sky looking west towards the core of the Moon's shadow approaching at 1 km/s. The author's camera with telephoto lens and solar filter is pointed at the Sun on a tripod immediately left of center.

Eclipse Observations

Shortly after the eclipse began, a hot air balloon appeared northeast of the observing site. As totality neared, the balloon had drifted to the southeast as seen in Figure 5. It was near the lunar umbra ground track's centerline during total eclipse.

Figure 5. A hot air balloon drifts southward in the observing site's southeast sky at 9:49 AM PDT as totality nears.

Before total eclipse, several walks to the shade of nearby birch and plum trees were made to examine "pinhole" images of the partially eclipsed Sun cast by interleaved foliage. An example of this phenomenon appears in Figure 6.

Figure 6. Multiple crescent-shaped images of the partially eclipsed Sun are cast by a plum tree's foliage onto bare earth about 30 m east of the observing site at 10:09 AM PDT. Cusps in these crescents point toward 10 o'clock in this view.

Many of the ensuing figures contain telephoto images of the Sun obtained by the author with common settings of 200 mm focal length, ISO 400 photosensitivity, and f/8 aperture. Camera shutter speed Δt is given for each telephoto exposure, the first of which appears in Figure 7 less than a minute before total eclipse began. More than 4 min earlier, the planet Venus could easily be discerned visually against the indigo sky northwest of the Sun.

Figure 7. Taken at 10:16:21 AM PDT, this filtered image of the Sun 0.8 min before total eclipse has Δt = 1/3 s. Note the detached cusp of the solar photosphere's crescent at right caused by a mountain or other elevated terrain on the Moon's limb.

As totality began at the observing site (see Figure 8), eyes rapidly adjusted to the million-fold decrease in illumination. The Dingle-Tuttle household, situated about 200 m southwest of the observing site, serenaded neighbors throughout the total eclipse with "Highland Cathedral" and "Amazing Grace" performances by guest bagpiper Nick Pierson.

Figure 8. A diamond ring appears at 10:17:06 AM PDT, 2 s before the predicted Totality Begins time in Table 1. This unfiltered image has Δt = 1/200 s, recording the Sun's inner corona and a prominence at 1 o'clock largely hidden behind the Moon's limb.

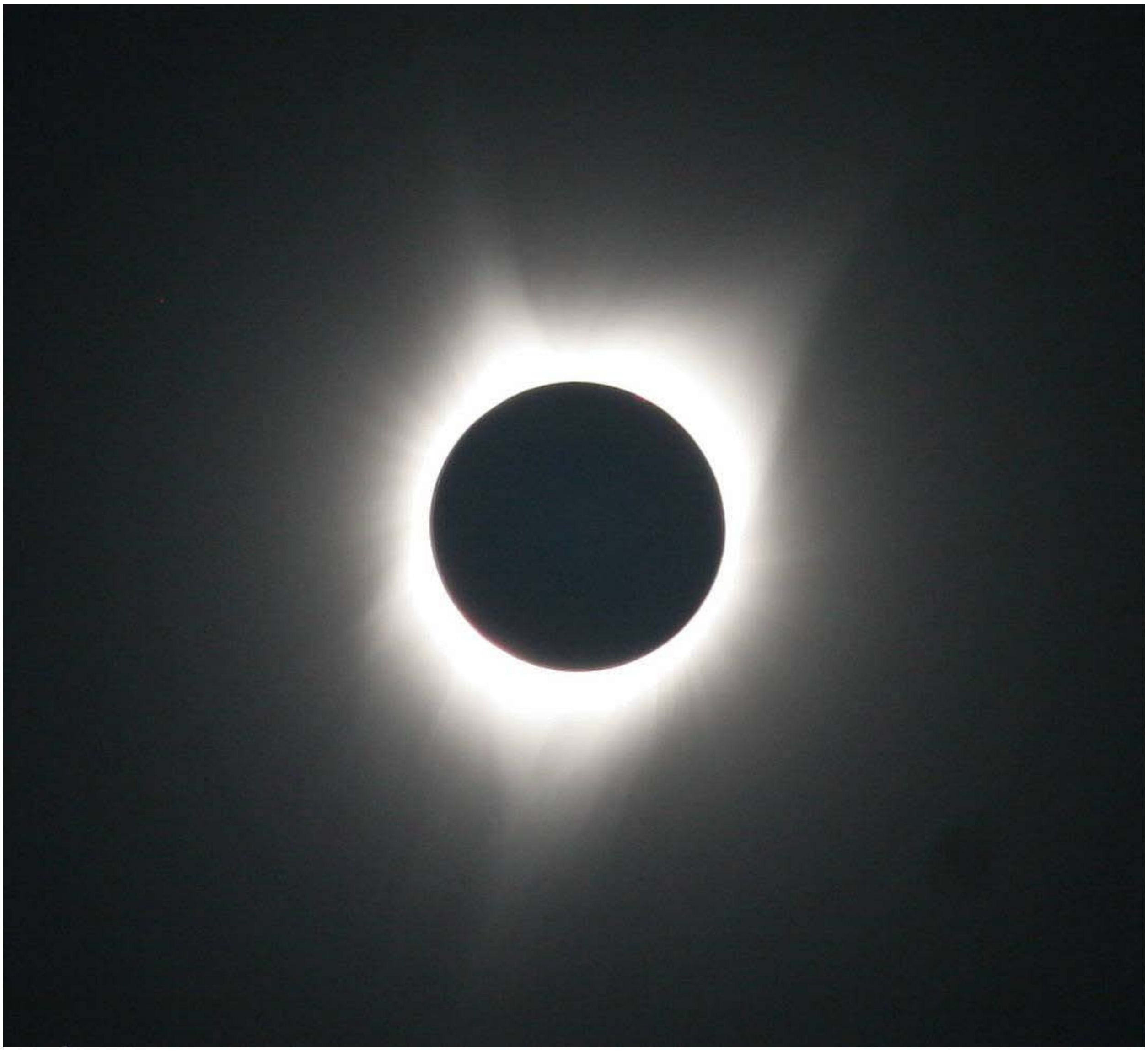

Figure 9. The Sun's irregular middle corona is revealed in this unfiltered image taken at 10:17:25 AM PDT with Δt = 1/15 s. Note the radial corona streamers emanating about the Sun's magnetic poles at 10 o'clock and 4 o'clock.

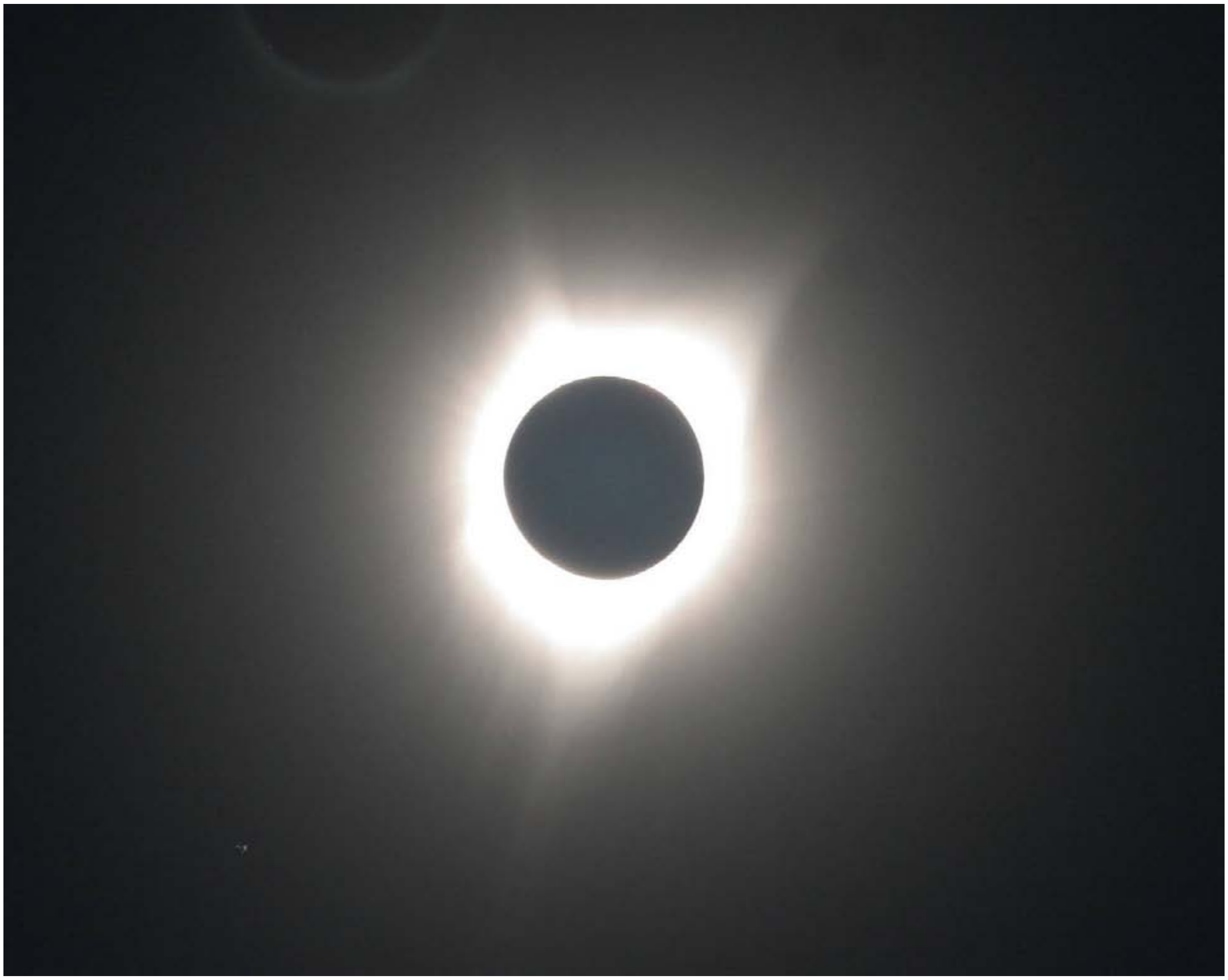

Figure 10. The Sun's ragged outer corona appears in this unfiltered image taken at 10:17:38 AM PDT with Δt = 1/4 s. The first magnitude star Regulus is imaged just outside two solar diameters from the Sun's center at 7 o'clock. A ghost image at top left is produced by inter-reflections among the telephoto lens's multiple optical elements.

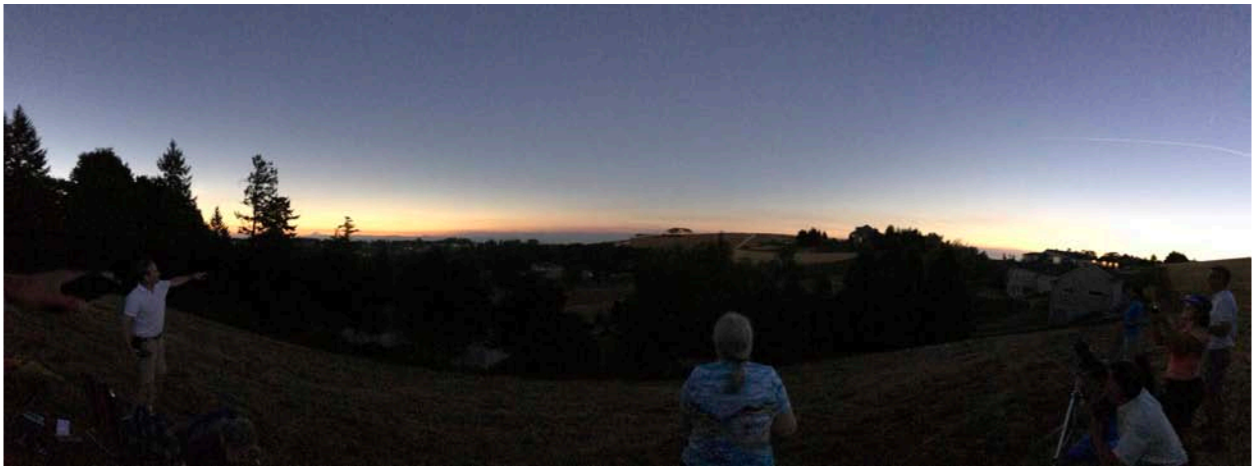

Figure 11. Eastward views from the observing site during total eclipse are captured in this panoramic image from Marilyn Schad. A jet contrail enters the Moon's umbra at right. Note Mt. Hood amidst sunset coloration outside the umbra at left.

Figure 12. The Sun's irregular middle corona is again recorded in this unfiltered image with Δt = 1/30 s taken at 10:19:06 AM PDT, only 4 s before the predicted Totality Ends event in Table 1.

Figure 13. A diamond ring heralds the end of totality in this unfiltered image taken with Δt = 1/30 s at 10:19:09 AM PDT, only 1 s before the predicted Totality Ends event in Table 1.

Figure 14. This filtered image is taken with Δt = 1/640 s at 11:32:40 AM PDT, about 5 min before the Eclipse Ends event in Table 1. Note the sunspot group near the Sun's center at 1 o'clock.

Eclipse Logistics and Safety

Oregon's Office of Emergency Management planned for a million eclipse-viewing visitors to the state. Post-eclipse consensus among state officials and those affected in the hospitality industry was a million visitors equated to a significant overestimate. Predictions of supply shortages never materialized. With the exception of a major eclipse festival in Prineville whose 30,000 visitors formed a 23-km line of cars on 16 August (the day before the festival began)[3], any traffic gridlock was limited to major arteries accessing the path of totality in hours immediately before and after the event. There were no eclipse-related fatalities or injuries reported in Oregon, nor did there appear to be any wildfires started by human activity in the path of totality throughout the state.[4]

Closer to the observing site, the author's Chinook Estates subdivision emplaced signage restricting access to private property and, with county permission, some of its public roads. Residents regularly patrolled subdivision roads with forty-six 2-hour shifts from 18 August until 22 August. No reports of fire or trespassing were recorded during the patrol period.

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[3] Reference http://www.bendbulletin.com/localstate/5523721-151/eclipse-traffic-already-backing-up-begin-in-central (accessed 3 September 2017)
[4] Reference http://www.oregonlive.com/eclipse/2017/08/oregon_eclipse_was_estimate_of.html (accessed 29 August 2017).

Consider the following explanation for why eclipse-driven disaster did not befall Oregon circa 21 August 2017. The entire state has an area of 254,806 km^2 and an estimated population in 2016 of 4,093,465 according to Wikipedia.[5], producing a mean population density of 16.1 Oregonians/km^2. Now assume a million people, both natives and visitors, occupy the state's zone of totality on 21 August 2017. This zone can be approximated by a rectangle 99 km from north to south and 332 km from east to west with reasonable accuracy, a region encompassing 32,868 km^2. The million eclipse viewers then produce an average population density of 30.4 viewers/km^2 in this rectangle. Although some areas in Oregon's zone of totality were inaccessible or inhospitable, others such as Prineville welcomed eclipse observers. These population density variations are similar to those between Oregon's cities and countryside.

Similar density statistics between Oregon's normal population and its approximated influx on 21 August 2017 indicate no unusual safety and logistics problems should have arisen during the eclipse, as was the case. Arguably, a valid traffic model for the eclipse would be Interstate Route 5 on a Saturday during which home football games are scheduled for both the University of Oregon in Eugene and Oregon State University in Corvallis. Traffic congestion on such a day (and presumably on 21 August 2017) would be confined to a period of hours; not days. Furthermore, potential for rowdy behavior or intoxicated driving among football game spectators is appreciably greater than for eclipse chasers. It is therefore little wonder emergency responses on 21 August 2017 involved little more than traffic management and crowd control.

The 21 August 2017 outcome will hopefully serve as an accurate planning model for future eclipses and other astronomical events. In preparing for the worst while hoping for the best in such cases, emergency preparedness leaders should have effects from a major sporting event in mind; not a major hurricane.

In Memoriam

A resident of Chinook Estates for many decades, Henry Herlong served his community in a variety of capacities. He was perhaps most famous among his neighbors as Chinook's original Adopt-A-Road Coordinator, and his perspective at Architecture Control Committee meetings was always valued. Henry was also a licensed Ham radio operator and published author. His final wish was to witness the 21 August 2017 total solar eclipse. After doing so, he passed away peacefully in his home at age 75. This account is dedicated to Henry's memory.

Henry Herlong

[5] Reference https://en.wikipedia.org/wiki/Oregon (accessed 29 August 2017).