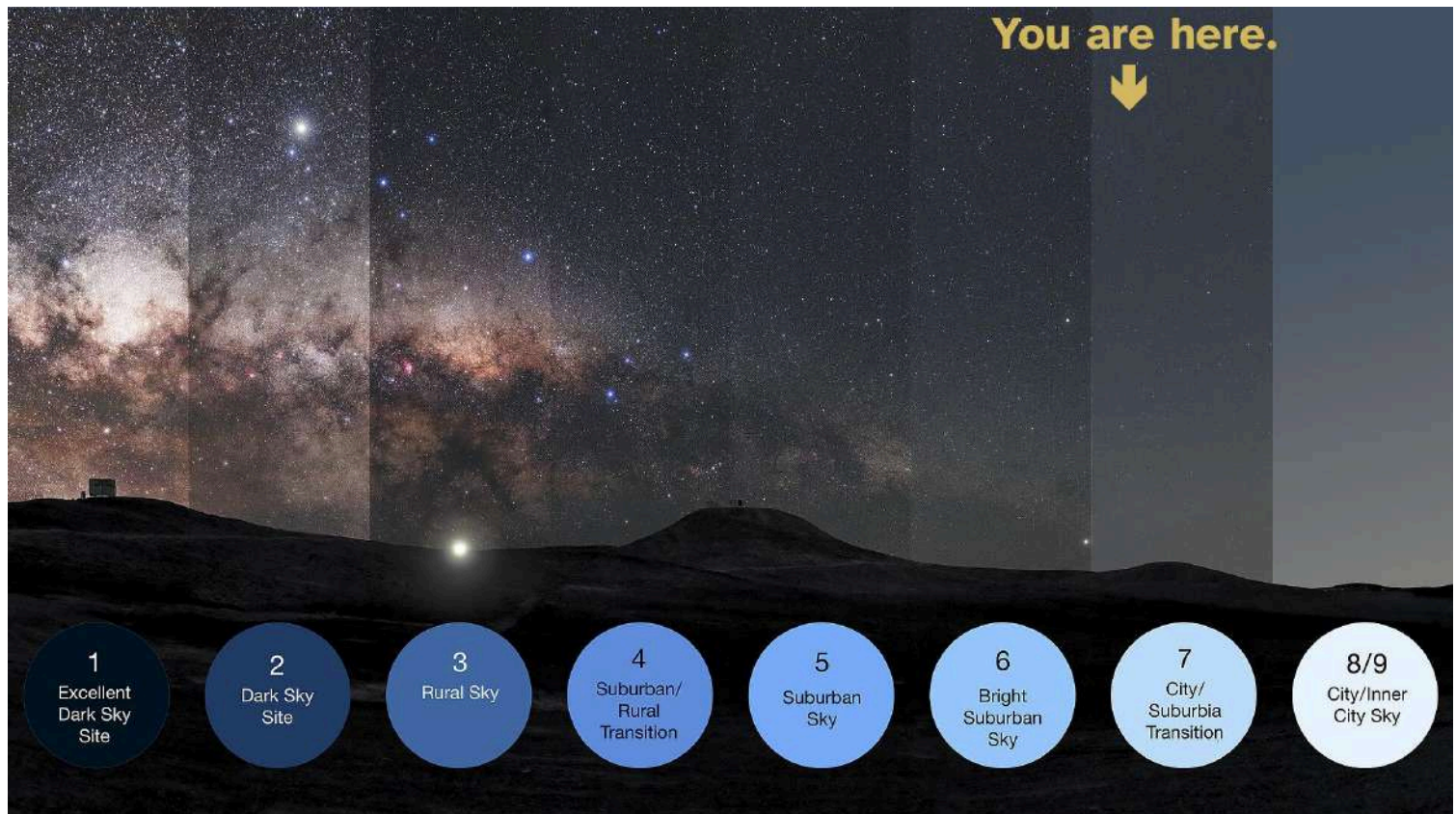


LIGHT POLLUTION



Volume 7, Number 7
July 2026

Club Website:
<http://vlgastroclub.org/>

Facebook:
<https://www.facebook.com/groups/vlgastroclub/>



SPECIAL LIGHT POLLUTION ISSUE

In addition to our usual club news, calendar, and monthly sky news, this issue features several articles on light pollution, both globally and locally.

Light pollution in our area, and in Florida in general has grown dramatically over

the past few years. Most areas have increased by 2 steps on the Bortle Scale (above) since 2019.

The effects of light pollution are particularly bad in Florida because of the amplifying effects of low altitude and high humidity. These effects make the effective visibility of the sky 2 steps worse than the images on the Bortle Scale above depict. A location that is Bortle 7 in our area has most of the sky washed out as shown in the above graphic at Bortle 9.

See the articles for more, below.

UPCOMING EVENTS

Executive Directors' Meeting, July 3rd, 11am-12pm, Fishhawk Rec Center, 2318 Buttonwood Run

All members welcome to our monthly planning meeting. This month we'll be planning our Camp Villages events, reviewing the fall and winter speaker schedules, and preparing for November's Starry Starry Night event.

Space Academy, July 6th, 6:30pm Truman Rec Ctr, 2705 Canal St.

Join us as Space Academy, where we talk about the basics of space, astronomy, and astrophysics. We cover recent events in astronomy research and space exploration.

Observers Workshop, July 6th, 8pm, Truman Rec Ctr, 2705 Canal St.

The July Observers' Workshop is likely to be inside the recreation center, after Space Academy, unless we get surprised by nice weather and clear skies, in which case we will move out to the Picnic Pavilion to enjoy a rare starry summer evening.

Join us for assistance with telescopes, observing, or Astronomical League programs.

Smart Scope Meetings are in abeyance through the summer. Join us when they restart in September, we are looking at changes to allow for more and better smart scope meetings in 2027!

Fruitland Park Astronomy Group, July 18th, 5pm, 300 Shiloh Rd, Fruitland Park

Join us for an evening of observing and astronomy talk with the Fruitland Park Astronomy Group! Come to Cales Soccer Field in Fruitland Park, 300 Shiloh Road (at the corner of Shiloh Road and Dixie Avenue, north of the Fruitland Park water tower.) Enter on Shiloh Road (some GPS's will guide you to the Dixie Avenue entrance.) Gate opens at 5pm. We will stay as late as conditions permit and people are

interested in observing. Bring power if required.

Public is welcome to this event, **no Villages ID required!** Bring family and friends to view the evening sky with our astronomers!



A crescent Moon meets Jupiter, Venus, Castor & Pollux on the evening of June 16th. Image by Jerry Stewart from northern NY.

General Meeting, July 21st, 6:30pm: Round Table: Your Astronomy Interests Plus: Grumpy's Ice Cream!

Join us for our annual round table where we hear from our membership! We want to know more about you, your interests in astronomy, what you enjoy about astronomy, what you like about our club, and what our club can do for you.

We will have the Grumpy's Ice Cream truck on hand to serve their wonderful ice cream to our members! So don't miss it!

Your Club Officers & Directors

President	Mark Graybill
Vice President	Ken Katta
Secretary	Randy Gilbert
Treasurer	Linda Meng
Space Academy	Toni Graybill
Public Relations	Jeffrey Kahler, Sr.
Directors	Craig Henry
	Burt Salk
	Tommy Kehne

Newsletter Contact:saundby@gmail.com

See Calendar at End of Newsletter, before star chart.

Club Calendar Online:

<https://vlgastroclub.org/calendar/>

NEWS

Paranal Power Plant Project Cancelled



Construction of a new power plant near the ESO site at Paranal, Chile threatened the dark skies used by these telescopes to study our universe. ESO image.

A power plant project slated for construction near the European Southern Observatory's site at Paranal, Chile has been cancelled according to an AES Andes announcement.

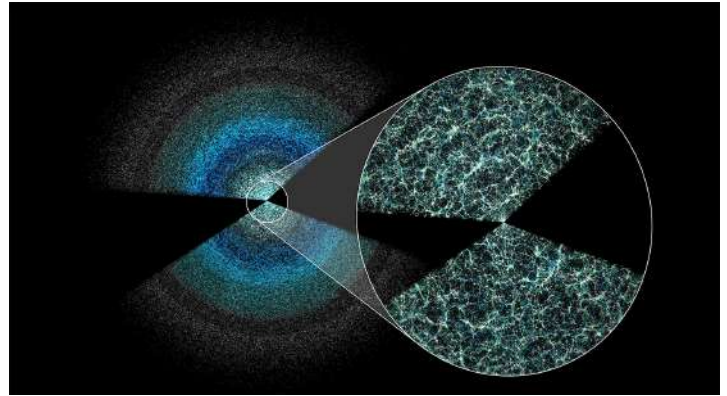
The plant, billed as a "green hydrogen" power plant, would have severely worsened the skies near the ESO's world-leading observatories placed at Paranal for the high altitude, extremely dark sky conditions. The Very Large Telescope (VLT) and Extremely Large Telescope (ELT) are among the instruments that would have been affected.

Site lighting for the power plant would have added a city's worth of light pollution only 5 miles from the observatories, severely degrading the ability of the observatories to function as intended. These, and the observatories at Atacama, are the most sensitive ground based observatories in the world, and are able to conduct studies that are not possible with space-based telescopes.

Fortunately, the energy company chose not to proceed with the new plant after astronomers worldwide expressed their concerns.

Full Article: [AES Andes Focuses on Renewables and Discontinues Green Hydrogen Development](#)

Dark Energy Spectroscopic Instrument Suggests Dark Energy May Change: Rubin Telescope May Confirm



A Slice of Data from DESI, with measurements taken above and below the plane of the Milky Way, shows the large-scale structure of the universe, where galaxy clusters form a filamentary structure in space. Image: Claire Lamman/DESI collaboration

The Dark Energy Spectroscopic Instrument (DESI) is a unique telescope based in Arizona that uses optical fiber based sensors to get precise distances of objects at billions of light years to form a 3D map of the universe. It has completed its first full survey of the sky in all directions that are not blocked by our own Milky Way galaxy, and will continue to work through at least 2028 to improve and verify its data.



Artistic composition of DESI and one year's data. Image by DESI Collaboration/KPNO/NOIRLab/NSF/AURA/P. Horálek/R. Proctor

The measurements of the DESI provide data for measuring the effects of dark energy in the expansion of our universe. By comparing the structure of the universe at closer distances against that farther out, and longer ago, the effects of dark energy on the formation of this structure can be seen.

Dark energy is a “fifth force” that seems to accelerate the expansion of the universe.

Until DESI’s recent measurements, dark energy was assumed to be constant throughout all time. However, the first data set from DESI released last year gave suggestions that that may not be the case. Dark energy may have been variable in the universe’s history. The second data release recently appears to strengthen that hypothesis.

While not yet proven, the variability of dark energy through time has been a hot topic as cosmology conferences, and the subject of many papers based on the DESI data and the DESI data combined with other data sets.

The Vera Rubin observatory’s capabilities may be able to settle the matter, however. Rubin will be using a completely different technique to study the effects of dark energy, weak gravitational lensing, also known as cosmic shear.



Vera C Rubin Observatory

With so little known about dark energy, a second dedicated set of measurements will be crucial to forming an understanding of it, and building a theoretical basis for understanding its history and effects on our universe, as well as the implications for the future of our universe.

The effect of dark energy can make our universe anything from an open, ever-expanding universe that never succumbs to contraction through gravity, or a stable universe, or one that will one day contract again.

Related Articles and Papers:

[DESI Completes Planned 3D Map of the Universe and Continues Exploring](#)

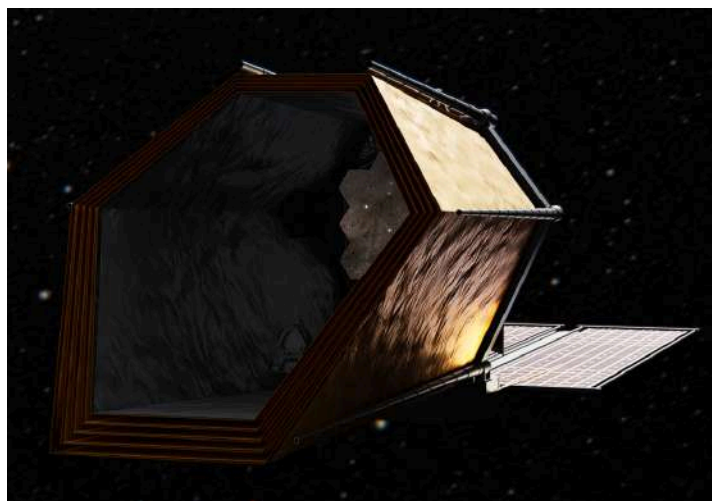
[New DESI Results Strengthen Hints That Dark Energy May Evolve](#)

[\[2606.14014\] Constraints on Stable Scalar-Tensor Dark Energy from DESI Data and Solar System Tests](#)

[\[2606.05539\] Dissipative Cosmology and the Nature of Dark Energy: Insights from Bulk Viscosity with DESI DR2 observations](#)

[Cosmic Shear | Rubin Observatory](#)

Hubble Previews Targets for Habitable Worlds Observatory



**Habitable Worlds Observatory, Artist’s Concept.
NASA Image**

The Habitable Worlds Observatory (HWO) is NASA’s next-generation space telescope beyond the Nancy Grace Roman Space Telescope, expected to launch in the 2040s. It will

be designed specifically to look for life on exoplanets using biosignatures in the atmospheres of distant worlds.

Recently we have had several false starts on announcements of biomarkers in exoplanet atmospheres. The issue with current instruments is that they are incapable of isolating specific elements' spectroscopic signatures well enough to distinguish those of biomarker compounds from other compounds that do not require biological processes.

The Habitable Worlds Observatory will use a mirror on the scale of the James Webb Space Telescope, or larger, projected to be around 8 meters in diameter. It is expected to launch aboard a heavy lift booster like Starship or New Glenn, which will support a very large space telescope.

It will employ high resolution ultraviolet observation in the Near Ultraviolet (NUV) and Far Ultraviolet (FUV) frequencies of light to isolate the signs of biomarkers in planetary atmospheres well beyond the capabilities of any instrument today.

To prepare for its mission, NASA wants to take advantage of the only space telescope capable of NUV and FUV observations today to help select and prioritize targets for the HWO. That telescope is Hubble, the only currently operable UV space telescope since the demise of FUSE and ultraviolet space telescopes that were flown on board the Space Shuttle.

zone will allow characterization of the UV emissions of the stars themselves, as well as a baseline of data on the effects of the planetary atmospheres on those emissions. It will not be enough to isolate biomarkers, but it will speed up and simplify the studies performed once HWO is in service.

Paper: [\[2606.05364\] A Critical UV Legacy: A Hubble Roadmap for HWO Science Readiness](#)

HWO Home Site: [Habitable Worlds Observatory](#)

NASA HWO Site: [Habitable Worlds Observatory - NASA Science](#)

Nancy Grace Roman Space Telescope to Launch as Early as August

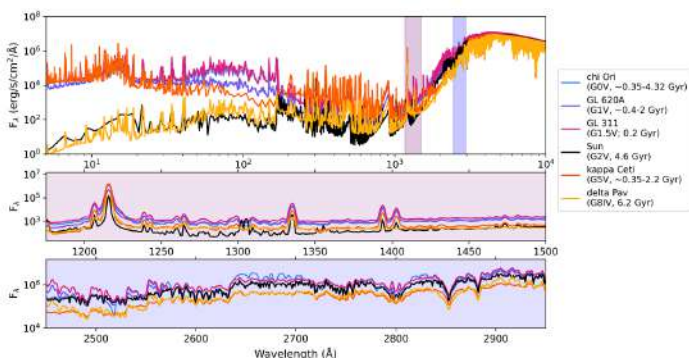
NASA's newest large space telescope named for NASA's first Chief Astronomer, Nancy Grace Roman, is scheduled to launch as early as April 30th atop a Falcon Heavy booster from historic Launch Complex 39A.

Originally known as WFIRST, the Widefield Infrared Space Telescope, the instrument was named for NASA's first chief astronomer who was a key figure in the development and operation of the Hubble Space Telescope, as well as NASA's development of cutting edge space-based astronomy through the series of Great Observatories launched to study our universe outside the effects of our atmosphere.

This will be the 2nd launch of Falcon Heavy in 2026, and its 13th mission. Falcon Heavy will send Roman to the Sun-Earth L2 point where it can observe without Earth's interference alongside JWST.

The telescope will study a wide range of science subjects, including dark matter distribution, exoplanet studies, and cutting-edge cosmology.

Mission website: [Nancy Grace Roman Space Telescope - NASA Science](#)



Spectral Energy Distributions of G-Type Stars
Image from full paper, below.

Hubble observations of the stars where exoplanets have been identified in the habitable

IN THE SKY THIS MONTH

Also refer to the sky map on the last page.

Apollo 11 Lunar Phase Threeppeat

Lunar phases repeat on a 19 year cycle relative to our solar calendar. Since this is the 57th anniversary of the landing of Apollo 11, it's the 3rd 19 year anniversary, and the lunar phase on July 20th, 2026 will be the same as it was on July 20th, 1969!

Go out for a look at the Moon this month during key dates in the Apollo 11 flight to see exactly what the Moon looked like back in 1969 when we first sent astronauts to land on the Moon.

Apollo 11 Launch: July 16th

Apollo 11 Lunar Orbit: July 19th

Apollo 11 Lunar Landing: July 20th

Apollo 11 Surface Departure: July 21st

Apollo 11 Return to Earth: July 24th

THE MOON

Last Quarter, July 7th

New Moon, July 14th

1st Quarter, July 21st

Full Moon, July 29th

Last Quarter, Aug 5th

Mars & Moon Bracket Pleiades July 10th

The Moon and planet Mars will appear on opposite sides of M45, the Pleiades, aka The Seven Sisters, in the early morning sky of July 10th. This will be visible by eye or binoculars.

The Moon will be close enough to M45 to see both in the same wide field view, though the full extent of the Pleiades will typically not be visible all at once. The pair will be separated by about 1 degree, but the Moon is half a degree across and M45 spans about 2 degrees all by itself.

Use your widest field eyepiece (usually your lowest power eyepiece) to see as much of the show as you can.

Mars will be well outside a normal scope field of view from M45, however.

THE PLANETS

July 1, 2026

Planet	Rise	Transit	Set
Mercury	8:05 am	2:49 pm	9:33 pm
Venus	9:44 am	4:25 pm	11:06 pm
Mars	4:01 am	10:50 am	5:39 pm
Jupiter	8:16 am	3:05 pm	9:54 pm
Saturn	1:40 am	7:49 am	1:58 pm

July 15, 2026

Planet	Rise	Transit	Set
Mercury	5:30 am	12:00 pm	6:30 pm
Venus	10:10 am	4:50 pm	11:30 pm
Mars	3:30 am	10:20 am	5:10 pm
Jupiter	7:40 am	2:40 pm	9:40 pm
Saturn	1:00 am	7:10 am	1:20 pm

July 30, 2026

Planet	Rise	Transit	Set
Mercury	4:50 am	11:20 am	5:50 pm
Venus	10:40 am	5:20 pm	11:50 pm
Mars	2:50 am	9:40 am	4:30 pm
Jupiter	6:50 am	1:50 pm	8:50 pm
Saturn	12:10 am	6:20 am	12:30 pm

Mars/Uranus Conjunction July 4th

From midnight to about 6:30am, the planet **Mars** will be only 6 arcminutes from the planet **Uranus** in our sky. That's one tenth of a degree!

If you have never seen Uranus in your telescope, this will be the time to do so, with bright Mars as your guide.

Mars will be magnitude 1.3, a bright reddish star about 3 finger-widths below the Pleiades.

Uranus will be magnitude 5.6, just a bit too dim to see in the skies of The Villages, but visible in binoculars or a telescope. Low magnification will show both planets. To see details on Mars at its current distance will require medium to high magnification (75x or greater, better views over 100x.) But only the largest details, e.g. polar cap, Syrtis Major, will be visible until Earth and Mars are closer together later this year.

The pair will only be within a degree of each other on the 4th, but will still be within a binocular's field of view of each other on the 5th.

Observing information for Mars:

<https://in-the-sky.org//data/object.php?id=P4>

Jupiter starts the month in the Sun's glare, setting less than an hour after the Sun. A clear western horizon will be necessary to see it. It will move into the Sun's glare as the month continues, having its conjunction with the Sun on July 29th, reappearing in the early morning sky on August 10th.

Jupiter observing information:

<https://in-the-sky.org//data/object.php?id=P5>

Venus is our bright evening star all month, and will remain so into the fall. Its phase can be seen in a telescope at low to medium powers (50-100x) and will go from a bit over half to a bit under through the course of the month.

Venus online finder chart:

<https://in-the-sky.org//data/object.php?id=P2>

Mercury disappears from the evening sky on the 6th, having been even closer to the Sun than Jupiter, then rises in the morning sky in mid-month. It gets further from the Sun in the morning sky from there, reaching 19 degrees from the Sun on August 2nd.

Mercury online viewing chart:

<https://in-the-sky.org//data/object.php?id=P1>

Saturn crosses into the evening sky this month, rising before midnight. Its rings continue to open further as the year goes on. It brightens from magnitude 0.8 to magnitude 0.6 as the month goes on (smaller numbers are brighter.)

Saturn finder chart:

<https://in-the-sky.org//data/object.php?id=P6>

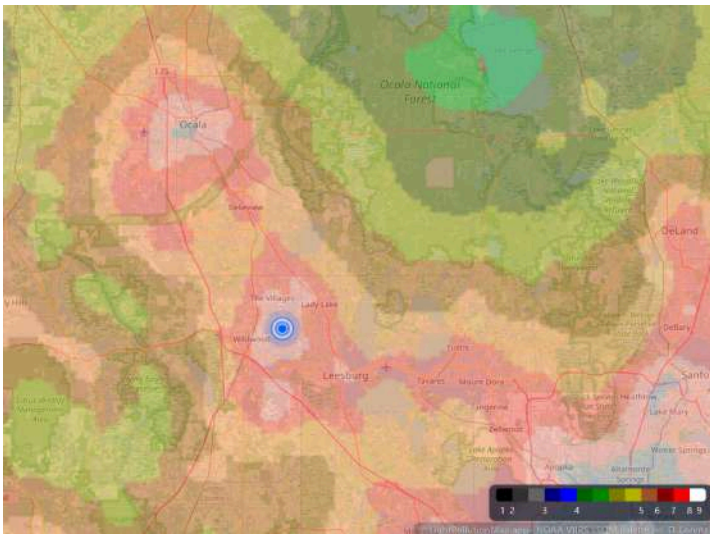
Pluto at Opposition

Pluto will shine at magnitude 14.5 when it is at opposition on July 27th. It has moved away from our galaxy's denser background star fields into Capricorn, where it will be easier to pick out. As dim as it is, the best way to locate the tiny planet* is by using a detailed star chart to see which star in your telescope's field doesn't belong--that's Pluto!

*per the geophysical definition of a planet--the definition used by planetary scientists.



Solar Viewing at Camp Villages June 24th, 2026
Images by Jeff Kahler



Light Pollution Map via lightpollutionmap.app

LIGHT POLLUTION: LOSING OUR SKY

Light pollution isn't just bad, it's getting worse at an incredible rate, and in every area.

Since 2019, The Villages and surrounding areas have lost over 1000 stars to the eye in the sky. Even under the best conditions, we can only see a few hundred, rather than thousands. Constellations become unrecognizable, our eyes can't adapt fully to the darkness, our sleep cycle is damaged, and our wildlife is affected as well.

This is not just an effect of the expansion of The Villages and surrounding areas. The developed areas became worse on their own as well. These areas had been on an improving trend since the 2010 time frame as better light fixtures were installed or existing fixtures were modified to meet the full-cutoff lighting standards. But now those improvements have been lost, and they were lost in less than half the time it took to gain them. And we haven't hit bottom yet. The decrease in quality of our darkness is both continuing and accelerating.

Factors in Light Pollution

Our area is especially vulnerable to light pollution. We have relatively thick air, due to our low altitude, and we have very humid air. Both of

these magnify the effects of artificial light in light pollution. When a light shines, there is more air to scatter that light in undesired directions, and more water in the air to amplify the air's effects.

Illumination engineers look at two main sources of light pollution--light that shines upward toward the sky, and glare, light that goes outside the area a light is intended to illuminate, but which is projected on a line that is horizontal or below the horizontal.

Some years ago, a standard for "full cutoff lighting" was established to try to reduce the first form of light pollution, artificial light that shines upward. What the standard failed to consider was the element of glare, which accounts for 40% of all light pollution. It also failed to consider the effects of light temperature--the color of the light.

The full cutoff light standard was useful with traditional lighting. Installations of full cutoff lighting improved light pollution in this area by about a full step in the Bortle Scale (see header graphic, page 1) from Bortle 6 to Bortle 5 in most residential areas. The lighting at that time had a relatively cool color temperature (more yellowish than blue), and limited brightness.



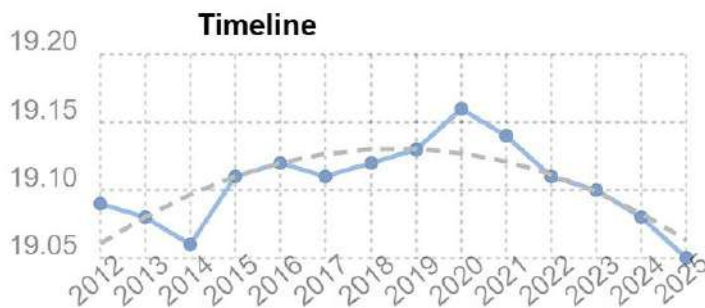
Since 2019-2020, however, the installation of new fixtures has shifted to LED lighting, however. While this lighting is technically “full cutoff”, that is, the fixture doesn’t shine upward, far more light pollution is generated.

All the prior progress has been lost, and then some.

The new lighting creates far more glare than the lighting it replaced. It’s a higher color temperature, and the shorter wavelengths of light are scattered by our air far more than the longer wavelengths of lower color temperature lighting. And, it’s brighter.

It doesn’t help that so much of our local lighting shines directly on the tops of trees planted directly under streetlights, casting shadows on the road while reflecting the bright light into the sky!

Not only that, but the lighting has no glare shielding. Many municipal fixtures don’t even have glare shields made for them any more. This means that the fixtures are shining light directly into drivers’ eyes, making it harder to see the road that they’re supposed to illuminate. Putting out more light from the fixture doesn’t help if you’re desensitizing the viewer’s eyes, any more than you can expect someone to see when you shine a flashlight directly into their eyes. Telling them, “There’s *PLENTY* of light!” doesn’t let them see better



Changes in sky quality, 2012-2025. Lower is worse. Chart via lightpollutionmap.info. Sample taken in The Villages CDD 5, which was developed in 2007.

So it’s not just astronomy that’s being affected. Nor our sleep patterns, or the lives of the wildlife we share our area with. Driving safety is

being affected, as well. Particularly given that older eyes have a much harder time adapting to rapid changes in lighting.

Fruitland Park

The observing site for The Fruitland Park Astronomy Group, the Cales Memorial Soccer Fields has suffered terribly over the last few years, too. In 2019, this site was an excellent suburban observing location. There were few nearby lights, and the sky quality was good. Magnitude 5 stars were regularly visible under clear skies, giving skies with over 1200 stars overhead.

Since then, the site has suffered one insult after another to the quality of its night sky. Unshielded street lights, far too bright for their use have been installed. A broken support for another light has pointed that lamp directly at the observing field from the northeast. Using the bathrooms turns on another lamp that’s too bright with no glare shield outside.

On top of that, the dome of light pollution rising from Leesburg has grown to twice its prior height. In 2019, the dome rose to about 10-12 degrees above the horizon. This didn’t affect the sky too much, since the lower the stars are, the more atmosphere they are viewed through so the lower stars were hard to see already. But now, the light dome reaches to about 25 degrees above the horizon, blocking the view of most of the southern stars in the sky. It also extends far further to the east and west, covering about 1/3rd of the sky below 20 degrees.

As a result, conditions in Fruitland Park are near urban. Only 200-300 stars are still visible under the best conditions. This is far worse than the sky brightness itself would suggest, and it’s caused by the terrible local glare from lights that should not be shining into the field.

Representatives of the city say that glare shields cannot be installed on the fixtures that intrude on the field areas.

The Primary Offenders

While lighting from homes and private landscapes has some effect on sky quality and viewing, the big problem here is municipal and commercial lighting. And the biggest problem here is the use of relatively inexpensive lighting fixtures that put out a lot of light in the blue end of the spectrum, and that generates a lot of glare.

The fact that lighting fixtures for these uses are sold without glare shields even being unavailable for them is incredible.

There are light fixtures available that limit their short-wavelength light output. They typically cost marginally more than the cheaper fixtures that put out a lot of blue and violet light. The cheaper fixtures seek to make an advantage of their failings by claiming that the light they put out creates 'more natural colors', ignoring the damage these wavelengths do to corneas, dark adaptation, and color sensitivity.

The fraction of light pollution that comes from glare was estimated at 40% based on studies from the past during a transition from traditional lighting to LED fixtures. That number is sure to rise, just as we've seen overall light pollution levels rise in spite of the increase of the use of full cutoff light fixtures. The problem with the definition of "full cutoff" is that it was an intentionally limited definition of the creation of light pollution that failed to consider the very effects that are causing worsening light pollution now.

The increase in the use of more and brighter lights, of worse design, coupled with increased growth (the effects of which we haven't even discussed so far, we have only looked at the changes in areas developed before the current problem emerged) means that our skies will continue to get worse and worse.

And looking at the stars may be the least important thing that that affects negatively, as important as darkness is to our health.

What is Light Pollution?

[What is Light Pollution? — Greater Big Bend International Dark Sky Reserve](#)

Protecting the Dark Sky:

<https://www.bigbenddarkskyreserve.org/>

Light Pollution, from [DarkSky.org](#):

[What is light pollution? | DarkSky International](#)

The Problem of Glare:

[Light Pollution – The Problem of Glare – 1/2.](#)

The Human and Ecological Cost of Poor Lighting Design--Ashahi Optics:

<https://www.asahi-optics.com/news/blog/what-is-light-pollution-what-is-glare.html>

National Park Service: Light Pollution and Its Effects:

[Light Pollution - Night Skies \(U.S. National Park Service\)](#)

[Light Pollution Map](#)

[Light pollution map](#)



Red Dimmable Street Lighting. Image by Signify.

Town Adopts Red Street Lights

Zuidhoek-Nieuwkoop, a town in Netherlands, has adopted red street lights primarily to protect their local bat population. The bats were being negatively affected during their evening and morning hunts by the light of regular street lights, causing a decline in their population.

(cont. next page)

The red street lighting was found to not have any negative effects on the bats, and likewise to be beneficial for the town's human inhabitants as well. The town took advantage of the ability to control the lights further to dim the lights during low traffic periods, improving the locals' sleep and circadian rhythms.

Article: [First Town In The World Adopts Red Street Lights | LightNOW](#)

Paper on effects on the bat population and insects: [Dimming streetlights in urban areas reduces insect attraction but pipistrelle bats forage more in darkness](#)

Article on adoption of dimmer and redder street lighting in cities: [From Denmark to the UK: Why European cities are installing red street lighting | Euronews](#)

Club Calendar

Special events by The Villages Astronomy Club

Events not hosted by The Villages Astronomy Club

Notable dates with no event planned.

July 2026

3 Astro Exec Meeting, 11am, Fishhawk Rec Ctr, 2318 Buttonwood Ln.

6 Space Academy, Observing Workshop (Inside after Space Academy), Truman Rec. Ctr. 2705 Canal St.

18 Fruitland Park Observing, 5pm, 300 Shiloh St. Fruitland Park

21 General Meeting: Your Astronomy Interests Roundtable

22, Wed Camp Villages, Blanchard Recreation Center, 1512 Craig Court, setup 8:00 AM, Event 9:00-10:00AM

No EAA Meeting Planned

August 2026

3 Space Academy, Observing Workshop (Inside after Space Academy), Truman Rec. Ctr. 2705 Canal St.

7 Astro Exec Meeting, 11am, Fishhawk Rec Ctr, 2318 Buttonwood Ln.

15 Fruitland Park Observing, 5pm, 300 Shiloh St. Fruitland Park

18 General Meeting: Resources Roundtable
No EAA Meeting Planned

September 2026

4 Astro Exec Meeting, 11am, Fishhawk Rec Ctr, 2318 Buttonwood Ln.

7 Space Academy, Observing Workshop Bino Wkshp, Truman Rec. Ctr. 2705 Canal St.

15 General Meeting, Carlos Garcia, Southern Cross Astro Soc., Remote Observing with SeeStar (& Other Smart Scopes)

19 Fruitland Park Observing, 5pm, 300 Shiloh St. Fruitland Park

Club Calendar: <https://vlgastroclub.org/calendar/>



The Moon with enhanced color by Andrew McCarthy. @AJamesMcCarthy on X.

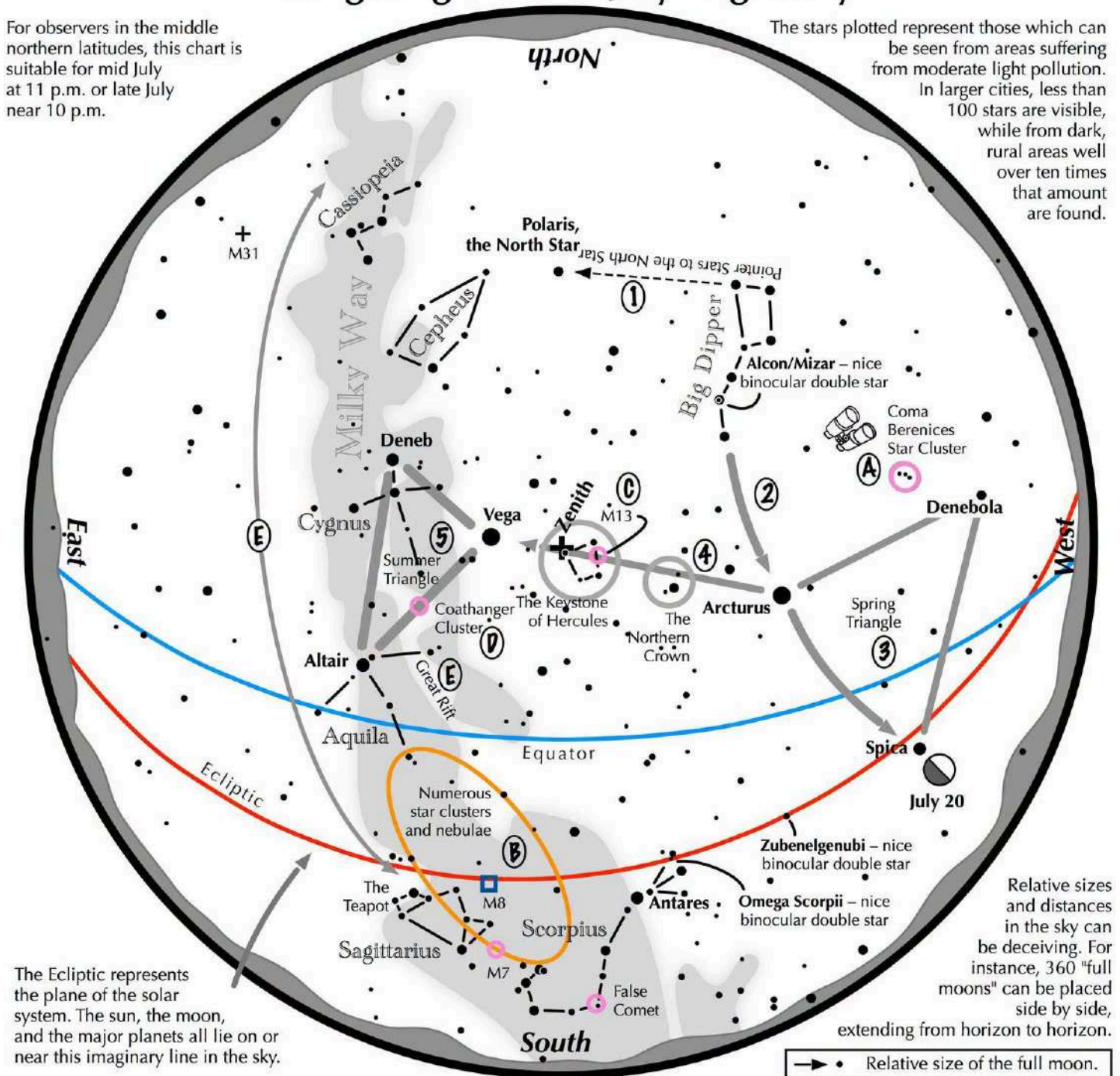
See the monthly star chart on following page:

Navigating the mid July Night Sky

2026

For observers in the middle northern latitudes, this chart is suitable for mid July at 11 p.m. or late July near 10 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

→ • Relative size of the full moon.

Navigating the mid July night sky: Simply start with what you know or with what you can easily find.

- 1 Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
- 2 Follow the arc of the Dipper's handle. It first intersects Arcturus, the brightest star in the July evening sky, then continues to Spica.
- 3 Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
- 4 To the northeast of Arcturus shines another star of similar brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
- 5 High in the East lies the Summer Triangle stars of Vega, Altair, and Deneb.

Binocular Highlights

- A: Between Denebola and the tip of the Big Dipper's handle, lie the stars of the Coma Berenices Star Cluster.
- B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
- C: On the western side of the Keystone glows the Great Hercules Cluster, containing nearly 1 million stars.
- D: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
- E: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.

Astronomical League www.astroleague.org; duplication is allowed and encouraged for all free distribution.

