OBSERVING HIGHLIGHTS for March 16 to April 1, 2024, a "bright" Moon period.
Black Canyon Astronomical Society (BCAS), western Colorado, USA

SUMMARY. The Sun shines directly on Earth's equator on March 19 (at 9:07 PM MDT), marking the spring equinox in the northern hemisphere. Colorado's sunlit hours are lengthening rapidly, and our nighttime hours are shortening. As twilight fades, during this "bright Moon" period, striking Jupiter is still visible in the west, about 25 degrees above the horizon, setting after 10:25 PM MDT. With a telescope, you can watch shadows of 3 of Jupiter's large moons cross the Giant Planet, including a prime-time transit of the shadow of Ganymede, the largest moon in the Solar System, on April 1 (see details in full report "JUPITER…"). Mercury makes its best evening appearance of 2024 during this period. On March 21 at 8:13 PM MDT, Mercury shines at magnitude -0.5 about 8 degrees above the western horizon. Mercury's greatest angular separation from the Sun is on March 24. After then, the Innermost Planet fades rapidly and moves into progressively brighter twilight prior to its solar conjunction on April 11. To avoid eye injury, do not look for Mercury when the Sun is above the horizon. Periodic Comet 12P/Pons-Brooks has been brighter than predicted in recent weeks, and you may be able to spot this "Halley-type comet" with binoculars during and shortly after late evening twilight (see charts in full report).

Venus is still a "morning star", but our Sister Planet is now rising in bright morning twilight and is no longer a striking sight in a dark sky. On the morning of March 21 Venus has a close (0.7°) conjunction with fainter Saturn, but this will be challenging to observe, even with binoculars (see details under Venus in full report). Mars is slowly emerging from morning twilight, but the Red Planet is still distant from Earth and shines at a rather anemic magnitude of +1. Do not look for Venus, Saturn, and Mars after sunrise: the Sun can be very dangerous to your eyes.

The Moon is at first quarter on March 16. From March 17 to 23, watch a gibbous Moon wax. The Moon is full on the night of March 24-25, when there is a penumbral lunar eclipse, which reaches maximum at 1:12 AM MDT. Penumbral lunar eclipses are subtle. Can you detect any darkening of the full Moon around 1 AM MDT? From March 26 to 31, we can watch a gibbous Moon wane. The Moon reaches last quarter on April 1.

The Sun has been impressively active recently. Extreme (X-class) solar flares have occurred in December and February. We expect more solar flares and coronal mass ejections of charged particles. You can monitor solar activity safely in real time on the internet. High solar activity is triggering auroras (aka "northern lights") and airglow, which have been photographed and seen from Colorado in the past year. So, keep watch for more of these phenomena! If auroras are not visible from Colorado, you may be able to view them online in real time from more northerly locations.

From western Colorado, there are evening passes of the bright International Space Station (ISS) on most evenings through this period, and there are morning passes of the almost-as-bright Tiangong (Chinese) Space Station from March 28 to April 1. Also "trains" of closely spaced, Starlink satellites from recent launches may be visible.

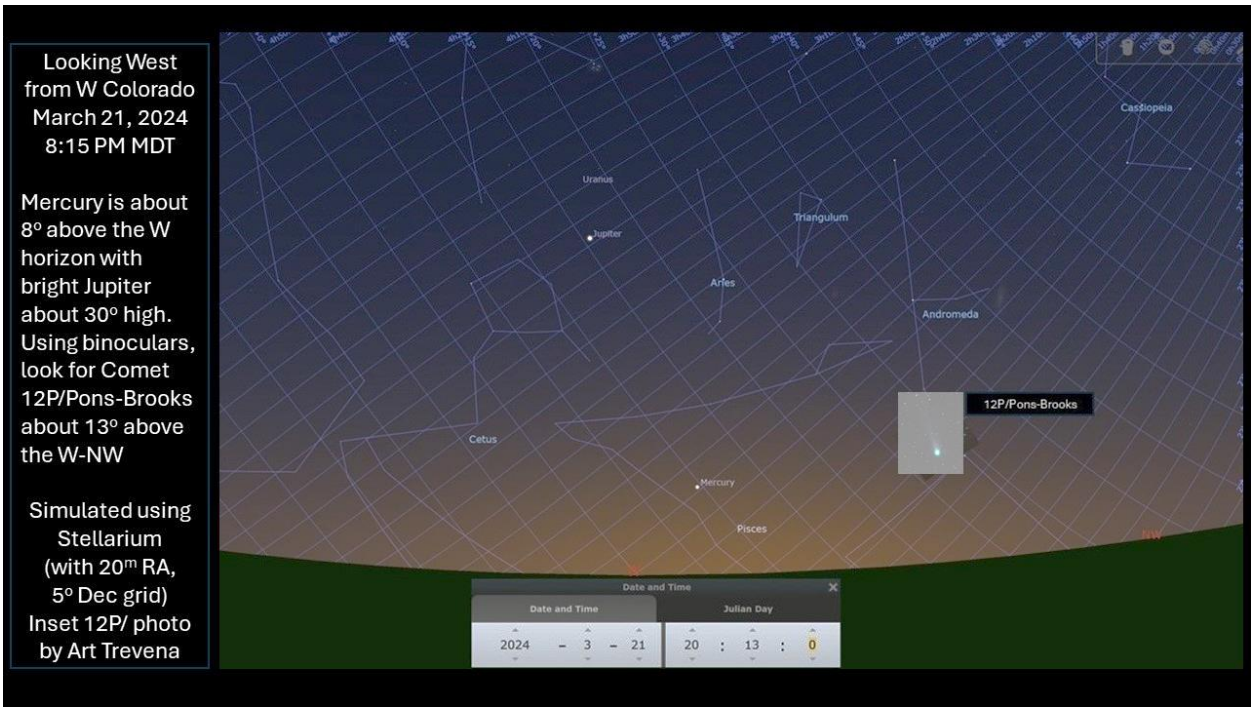
WESTERN SLOPE SKIES. Since 2011, BCAS and KVNF Community Radio have been producing Western Slope Skies (WSS), a biweekly astronomy feature, which airs every two weeks at about 8:10 AM on Fridays and 7:00 PM on Wednesdays. On March 15 and 20, Bob Grossman explains how the Western Slope Dark Sky Coalition is working to ensure that western Colorado's naturally dark night skies remain that way. Then on March 29 and April 3, Art Trevena will describe how you can experience the April 8, 2024 solar eclipse, which will be total along a narrow path covering parts of Mexico, the U. S. (Texas to Maine) and southeastern Canada.

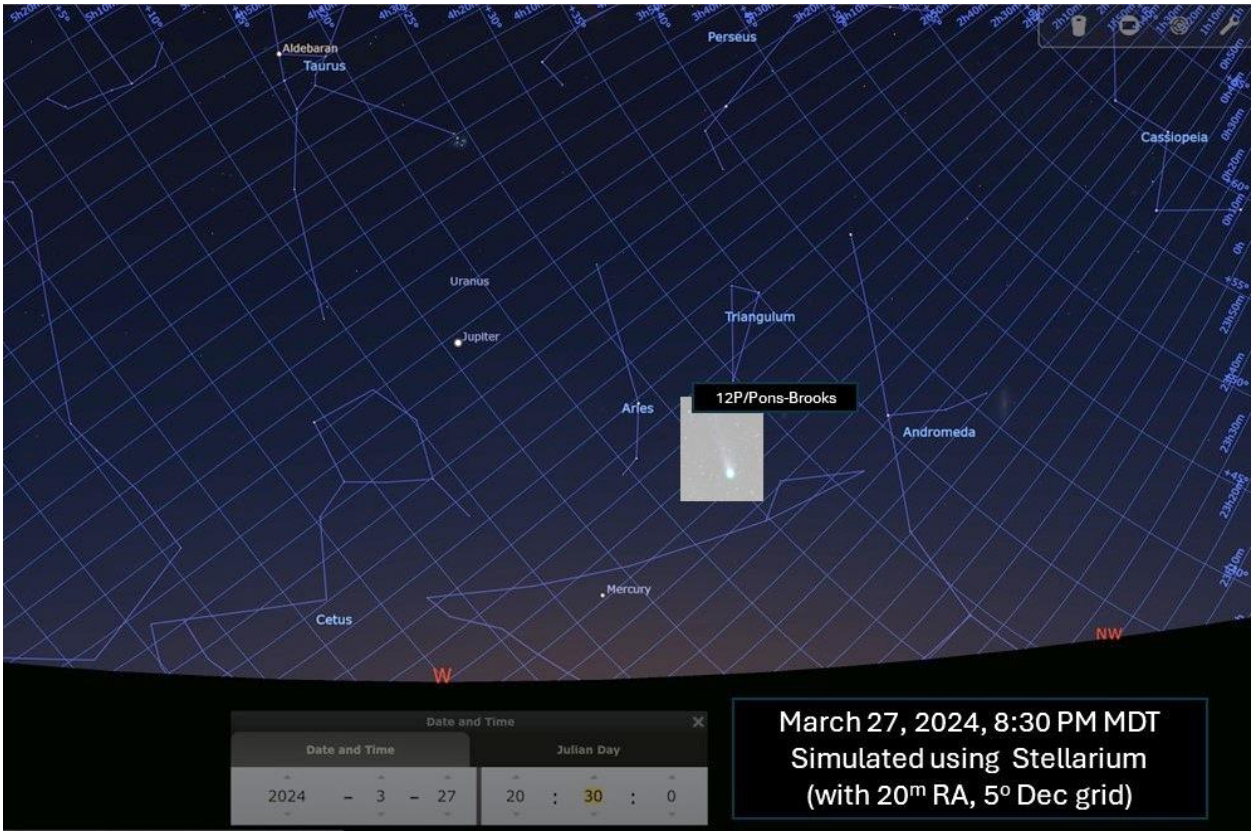
Note: The apparent brightness of sky objects is measured in "magnitude" units. Many bright stars are magnitude +1, while the faintest stars easily visible to unaided eyes under dark skies are magnitude +6. Some of the brightest stars are 0 magnitude (e.g., Vega, Arcturus), while the brightest sky objects have negative magnitudes (e.g., Sirius at -1.5, Jupiter at -2 to -3, Venus at -4 to -5, the full Moon at -12 to -13, and the Sun at -26.7 magnitude). Angular distances on the sky are usually cited in degrees of arc. Helpful ways to estimate 1, 5, 10, 15, and 25 degrees of arc can be found here: https://www.timeanddate.com/astronomy/measuring-the-sky-by-hand.html

MARCH 19: EQUINOX. Sunlit hours in Colorado are lengthening rapidly as our nighttime hours shorten. Our spring equinox occurs on March 19 at 9:07 PM MDT. That's when the Sun shines directly on Earth's equator, as spring begins in the northern hemisphere and autumn begins in the southern hemisphere.

THE MOON. The Moon is at **first quarter on March 16** (exactly at 10:11 PM MDT). From March 17 to 23, we can watch a gibbous Moon wax. **The Moon is full on the night of March 24-25** (exactly full at 1:00 AM MDT on March 25), when the Moon moves through the partial shade of Earth's penumbral shadow, causing a **penumbral lunar eclipse from 10:50 PM to 3:34 AM MDT**. One experienced skywatcher has said that that "a penumbral lunar eclipse is only slightly more impressive than no eclipse." Can you detect some darkening on the south side of the full Moon, especially around maximum eclipse at 1:12 AM MDT? From March 26 to 31, we can watch a gibbous Moon wane. The Moon reaches **last quarter on April 1** (exactly at 9:15 PM MDT). NASA has published a stunning visualization of lunar phases for year 2024. The current "eclipse season" extends into early April, and it's time to get ready to watch the Moon eclipse the Sun on April 8, 2024. The April 8 solar eclipse will be total across a path that runs through parts of Mexico, Texas, Oklahoma, Arkansas**,** several midwestern states, Pennsylvania, New York, New England, and southeastern Canada. All 48 contiguous U.S. states will experience a least a partial solar eclipse on April 8. At the March 21 BCAS meeting (7:00 PM MDT in Montrose (also accessible online), we will have a presentation entitled "Total Solar Eclipse – April 8! USA, Mexico, Canada."

AN EVENING COMET! In recent weeks Periodic Comet 12P/Pons-Brooks has been brightening rapidly. Using binoculars, you likely can spot the Comet in the west-northwestern evening sky. On the evening of March 9, Art Trevena spotted 12P/Pons-Brooks with 8x42mm binoculars and could see the Comet's tail in 10x70mm binoculars. This period may be a good time to start watching it. Look for 12P/ low in west-northwestern sky during and shortly after late twilight, especially after March 26, when moonlight will not interfere. To spot 12P/, find a place where the west-northwest is unobstructed and use the charts below and binoculars. Around March 21 Comet 12P/ will be about 13° above the west-northwestern horizon at 8:13 PM MDT. On March 21 spotting Comet 12P/ could be challenging due to interference from both the bright Moon and twilight. But by March 27 the Moon rises later, and it might be easier to spot 12P/ in a darker sky at about 8:30 PM MDT. 12P/Pons-Brooks is a periodic, Halley-type comet with a 71-year orbital period. It will be closest to the Sun (at 73 million miles) on April 21 and closest to Earth on June 2 (at 144 million miles). You can find more info here…
12P/Pons-Brooks | astro.vanbuitenen.nl
https://theskylive.com/12p-info
https://www.virtualtelescope.eu/2024/03/06/multiscale-imaging-of-comet-12p-pons-brooks-pictures-and-time-lapse-5-mar-2024/





MERCURY AS AN "EVENING STAR." During this period Mercury makes its best evening appearance of 2024. Use a planetarium app or the charts above to find the Innermost Planet (binoculars may help).

On March 16 Mercury shines brightly at magnitude -1.00, but then fades to magnitude -0.49 on March 21, magnitude +0.38 on March 27, to magnitude +1.64 on April 1. On March 16, Mercury's gibbous disk (as seen through telescopes) is 74% illuminated and 6.1 arc seconds wide. Mercury attains its maximum angular separation from the Sun on March 24, when it appears as a 42% illuminated, 7.5arc second-wide crescent. Then Mercury moves rapidly into very bright twilight. On April 1, Mercury appears as a thin, 14%-illuminated crescent that is 9.6 arc seconds wide, but it will be challenging to spot. Between March 16 and April 1 Mercury's distance from Earth decreases from 103 to 65 million miles, as "Speedster Planet" approaches solar conjunction on April 11. While passing on the nearside of the Sun on April 11, Mercury will be only 54 million miles distant (but invisible in the Sun's glare). **Please do your Mercury spotting after sunset. NEVER chance looking at the Sun directly; serious eye damage can result.**

JUPITER IN THE EVENING. Not long after sunset, look for Jupiter, shining brightly, about 25 degrees above the western horizon. Between March 16 and April 1, the Giant Planet fades slightly (from magnitude -2.11 to -2.06), as its distance from Earth increases from 523 to 538 million miles. Jupiter sets in the west northwest at about 11:13 PM MDT on March 16 and 10:26 PM MDT on April 1. Through telescopes or binoculars, the Giant Planet's apparent equatorial diameter decreases from 35.1 to 34.0 arc seconds during this period. Use a telescope or binoculars to spot Jupiter's four bright moons. You can identify them by their changing positions and referring to various planetarium apps or this website: https://skyandtelescope.org/wp-content/plugins/observing-tools/jupiter_moons/jupiter.html
If you have a telescope, view shadow transits (Jovian solar eclipses!) of Jupiter's moons on the nights listed below. Jupiter is setting earlier now, and only four of these events are visible from western Colorado during this period. Ganymede, the largest moon in the Solar System, casts the largest shadow of Jupiter's moons, and its shadow is usually the easiest to spot crossing the Giant Planet. There is a "primetime" transit of Ganymede's shadow on the evening of April 1 (see below). Europa's small shadow can be challenging to spot, but Io's shadow is larger than Europa's shadow.

March 17, 2024. 8:34 to 11:02 PM MDT. Europa's shadow crosses Jupiter. (Locally, this event ends with Jupiter low in the west-northwest. Jupiter sets at 11:09 PM MDT).

March 23, 2024, 6:06 PM to 8:16 PM MDT. Io's shadow crosses Jupiter. (Locally, this event begins in daylight and ends during evening twilight. On March 23, the Sun sets at about 7:29 PM MDT).

March 30, 2024, 8:00 PM to 10:12 PM MDT. Io's shadow crosses Jupiter. (Locally, this event begins in evening twilight and ends with Jupiter low in the west-northwestern sky. On March 30, the Sun sets at about 7:36 PM MDT).

April 1, 2024, 8:34 PM to 10:26 PM MDT. Ganymede's shadow crosses Jupiter at a very high southern latitude on Jupiter. (Locally Jupiter sets near the end of this event at about 10:26 PM MDT).

KEEP WATCHING THE NORTHERN CROWN! Will there soon be a bright "new" star in Constellation Corona Borealis (the "Northern Crown"), at least briefly? T Coronae Borealis (T CrB) is a recurrent nova that may rapidly increase in brightness 1500-fold (to second magnitude) to become the brightest star in Corona Borealis sometime between now and next September. Then it may fade rapidly below naked-eye visibility in about a week. As of the morning of **March 15,** T CrB had not yet detonated. For more on this, read the article, "Get Ready for a Nova's Bright Return", by astrophysicist Brad Schaefer in the March 2024 issue of Sky & Telescopes Magazine, p. 34-40. You can find additional info at these sites… https://blogs.nasa.gov/Watch_the_Skies/2024/02/27/view-nova-explosion-new-star-in-northern-crown/

https://en.wikipedia.org/wiki/T_Coronae_Borealis
https://ui.adsabs.harvard.edu/abs/2023ATel16107....1S/abstract
https://www.aanda.org/articles/aa/full_html/2023/12/aa48372-23/aa48372-23.html
https://skyandtelescope.org/observing/whats-up-with-t-crb04202016/

VENUS – RISING IN BRIGHT MORNING TWILIGHT. Venus is rising just south of east in progressively brighter morning twilight, at about 6:39 AM MDT on March 16 (42 minutes before sunrise) and at 6:24 AM MDT on April 1 (just 32 minutes before sunrise). At magnitude -3.9, Venus is still very bright, but it's no longer a striking sight in a dark sky. On March 21, Venus appears very close to Saturn, as the Ringed Planet emerges from its solar conjunction of February 28. But the March 21 Venus-Saturn conjunction will be challenging to observe. Find a place with an unobstructed east-southeastern horizon, use binoculars, and hope for clear, transparent skies. At 6:45 AM MDT on March 21 (with the Sun just 6 degrees below the horizon), look for Venus about 2 degrees above the horizon. Shining at magnitude -3.9, Venus is about 90 times brighter than +1.0-magnitude Saturn. You will likely need those binoculars to spot Saturn less than one degree below Venus. Between March 16 and April 1, Venus' distance from Earth increases from 146 to 151 million miles, and its apparent diameter (as seen through telescopes) decreases from 10.6 to 10.3 arc seconds. Use a telescope to watch Venus' slightly gibbous disk wax from 94% to 96% illuminated between March 16 and April 1. Venus, now on the opposite side of the Sun from Earth, is nearly at "full phase." **Please do your Venus (and Saturn) spotting before sunrise. NEVER chance looking at the Sun directly; serious eye damage can result.**

MARS IN MORNING TWILIGHT. Mars is slowly emerging from morning twilight. The Red Planet rises in the east southeast during nautical twilight on March 16 at about 6:07 AM MDT and on April 1 at about 5:38 AM MDT. Between March 16 and April 1, Mars brightens slightly from magnitude +1.21 to +1.17, as its distance from Earth decreases from 200 to 194 million miles. During this period Mars' disk (as seen through telescopes) appears tiny, less than 5 arc seconds wide. **Please do your Mars spotting before sunrise. NEVER chance looking at the Sun directly; serious eye damage can result.**

THE SUN. The Sun has been very active over the past 15 months. There have been M-class (moderate) solar flares each week, and even some X-class (extreme) solar flares. There also have been many coronal mass ejections ("CMEs") of charged particles that have triggered auroras. Airglow also results from high solar activity, and this phenomenon has been photographed and observed from Colorado. As of March 15, there are only a few sunspots and active regions on the Earth-facing side of the Sun, but more active regions and sunspots may come into view as the Sun rotates. M-class (moderate) and even X-class (extreme) solar flares are likely during this period. Some flares may be associated with CMEs. You can monitor sunspots, solar flares, CMEs, and other solar activity safely and in "real time" at the following sites:
https://sdo.gsfc.nasa.gov/data/
https://stereo.gsfc.nasa.gov/beacon/
http://halpha.nso.edu/
https://www.swpc.noaa.gov/
https://sohowww.nascom.nasa.gov/data/realtime-images.html
http://www.sidc.be/silso/ssngraphics
Do not look at the Sun directly without safe, specialized solar filters. Looking at the Sun can be very dangerous unless you take adequate precautions. Severe eye damage and even blindness can result.

AURORAS (aka "polar lights" or "northern lights"). It can be challenging to spot auroras from Colorado's mid-northern latitudes, but in the past year auroras were photographed and seen from

Colorado and even farther south in Arizona! Solar magnetic storms, when directed toward Earth, can cause auroras. With current, high solar activity, chances for auroras are good. You can get predictions and updates for auroras, their intensity, and geographic extent from NOAA's Space Weather Prediction Center:
https://www.swpc.noaa.gov/.
https://www.swpc.noaa.gov/products/aurora-viewline-tonight-and-tomorrow-night-experimental
We can watch aurora in real-time from Yellowknife, Northwest Territories on an all-sky camera at the Canadian Space Agency's AuroraMax website. Like Colorado, Yellowknife is in the Mountain Time Zone. Other aurora webcams are also operating. See this review article…
https://www.space.com/northern-lights-webcams-watch-aurora-online

EARTH SATELLITE HIGHLIGHTS. The following predictions are for western Colorado, specifically Montrose, in Mountain Daylight Time (MDT). Numerous Earth satellites are visible every clear night. Brighter satellites have smaller magnitude numbers, and the brightest (e.g., the International and Tiangong Space Stations) may have negative magnitudes. These predictions are for selected passes of some bright and/or interesting satellites (as summarized from Heavens-Above.com). Satellite orbits can change. These predictions for satellite passes may be inaccurate by up to several minutes, especially after March 19. For more accurate predictions of these and other satellites, check Heavens-Above.com or other satellite prediction sites for updates on the nights you wish to observe. Be sure to set application(s) for your location and time zone.

Starlink satellite "trains", when viewed from less than 1 day to about 4 days after launch, can be very eye-catching! Check Heavens-Above.com (or other sites) for updated, local predictions of "trains" of Starlink satellites. Starlink satellites are launched often, typically once or twice per week.

March 15, 2024. International Space Station (ISS). 9:16 to 9:18 to 9:19 PM MDT. WNW to NNW to N. Max altitude 20 deg above NNW, disappears into Earth's shadow at 18 deg above N, max magnitude -1.4 (Passing through Pisces/Aries, Andromeda, Cassiopeia, and Cepheus). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 16, 2024. International Space Station (ISS). 8:28 to 8:31 to 8:34 PM MDT. W to NNW to NNE. Max altitude 27 deg above NNW, disappears into Earth's shadow at 9 deg above NE, max magnitude -1.8 (Passing through Pisces, Aries, Andromeda, Cassiopeia, Cepheus, and Draco). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 17, 2024. International Space Station (ISS). 9:19 to 9:21 to 9:22 PM MDT. NW to NNW to N. Max altitude 12 deg above NNW, disappears into Earth's shadow at 11 deg above N, max magnitude -0.9 (Passing through Andromeda, Cassiopeia, Cepheus, and Draco). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 18, 2024. International Space Station (ISS). 8:30 to 8:33 to 9:35 PM MDT. WNW to NNW to NNE. Max altitude 15 deg above NNW, disappears into Earth's shadow at 5 deg above NNE, max magnitude -1.0 (Passing through Andromeda, Cassiopeia/Lacerta, Cepheus, and Draco). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 20, 2024. International Space Station (ISS). 8:33 to 8:34 to 8:34 PM MDT. NNW to N to NNE. Max altitude 10 deg above NNW, disappears into Earth's shadow at 4 deg above NE, max magnitude -0.7

(Passing through Andromeda, Lacerta, Cepheus, and Draco). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 23, 2024. International Space Station (ISS). 9:22 to 9:23 PM MDT. in N. Disappears into Earth's shadow at max altitude 12 deg above N, max magnitude -1.0 (Passing through Lacerta, Cepheus, and Draco). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 25, 2024. International Space Station (ISS). 9:20 to 9:23 PM MDT. NNW to N. Disappears into Earth's shadow at max altitude 18 deg above N, max magnitude -1.5 (Passing through Andromeda/Lacerta/Cassiopeia, Cepheus, and Draco). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 26, 2024. International Space Station (ISS). 8:32 to 8:34 to 8:36 PM MDT. NNW to NNE to NE. Max altitude 14 deg above NNE, disappears into Earth's shadow 11 deg above NE, max magnitude -1.4 (Passing through Lacerta, Cepheus, Draco, and Boötes). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 27, 2024. International Space Station (ISS). 9:19 to 9:22 PM MDT. NW to N. Disappears into Earth's shadow at max altitude 33 deg above N, max magnitude -2.5 (Passing through Andromeda, Cassiopeia, Cepheus, and Ursa Minor). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 28, 2024. Tiangong (Chinese Space Station). 6:09 to 6:12 to 6:15 AM MDT. SSW to SSE to E. Max altitude 29 deg above SSE, max magnitude -0.6 (Passing through Lupus, Scorpius, Sagittarius, Capricornus/Aquila, and Aquarius). **Tiangong's orbit may change frequently. Check for updates.**

March 28, 2024. International Space Station (ISS). 8:30 to 8:33 to 8:35 PM MDT. NNW to NNE to ENE. Max altitude 25 deg above NNE, disappears into Earth' shadow 18 deg above ENE, max magnitude -2.3 (Passing through Cepheus, Draco, and Ursa Major/Boötes). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 29, 2024. Tiangong (Chinese Space Station). 5:09 to 5:12 AM MDT. SE to ESE. Appears from Earth's shadow at max altitude 16 deg above SE, max magnitude +0.3 (Passing through Sagittarius, Capricornus, Aquarius, and Pegasus). **Tiangong's orbit may change frequently. Check for updates.**

March 29, 2024. International Space Station (ISS). 9:17 to 9:20 PM MDT. NW to W. Disappears into Earth's shadow at max altitude 68 deg above W, max magnitude -3.6 (Passing through Andromeda/Triangulum, Perseus, Auriga, and Gemini). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 30, 2024. Tiangong (Chinese Space Station). 5:42 to 5:43 to 5:46 AM MDT. SSW to SSE to E. Appears from Earth's shadow 30 deg above SSW, max altitude 45 deg above SSE, max magnitude -1.5 (Passing through Libra, Ophiuchus, Aquila, Delphinus, and Pegasus). **Tiangong's orbit may change frequently. Check for updates.**

March 30, 2024. International Space Station (ISS). 8:28 to 8:31 to 8:33 PM MDT. NW to NE to ESE. Max altitude 57 deg above NE, disappears into Earth's shadow 21 deg above ESE max magnitude -3.6

(Passing through Cassiopeia, Camelopardalis, Ursa Major, and Leo). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

March 31, 2024. Tiangong (Chinese Space Station). 6:14 to 6:17 to 6:21 AM MDT. W to NNW to ENE. Appears from Earth's shadow 13 deg above W, max altitude 73 deg above NNW, max magnitude -2.1 (Passing through Virgo, Boötes, Draco, Lacerta, and Pegasus). **Tiangong's orbit may change frequently. Check for updates.**

March 31, 2024. International Space Station (ISS). 9:15 to 9:18 to 9:19 PM MDT. WNW to SW to SSW. Max altitude 24 deg above SW, disappears into Earth's shadow 22 deg above SSW max magnitude -2.0 (Passing through Aries-near Jupiter, Taurus, Orion-near Rigel, and Canis Major). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

April 1, 2024. Tiangong (Chinese Space Station). 5:14 to 5:17 AM MDT. ESE to ENE, Appears from Earth's shadow at max altitude 66 deg above ESE, max magnitude -2.0 (Passing through Hercules, Cygnus, and Pegasus). **Tiangong's orbit may change frequently. Check for updates.**

April 1, 2024. International Space Station (ISS). 8:25 to 8:29 to 8:32 PM MDT. WNW to SW to SSE. Max altitude 46 deg above SW, disappears into Earth's shadow 11 deg above SSE max magnitude -2.9 (Passing through Trianglum Aries, Taurus-near Aldebaran, Orion-near Betelgeuse, Monoceros, and Puppis). **Predictions for the ISS are subject to change due to orbital adjustments. Check for updated predictions.**

HAPPY OBSERVING!