

Photographing the April 8 Total Solar Eclipse

by Dennis Freeman <u>dennisfreeman4510@msn.com</u>



Total Solar Eclipses are rare. (The next good one in CONUS is 21 years from now in 2045). And April's eclipse will have a larger corona with more outflows & spikes than usual!



Partial eclipse before & after totality.

We can photograph ALL of these effects:

- The Corona: the spectacular outer atmosphere that extends millions of kilometers and has tempertures > 1 million degrees.
- The **Chromosphere:** a thin layer of plasma that lies between the Sun's visible surface and the corona. Can be very red.
- Solar Prominances: large plasma structures extending outward from the Sun's surface, often in loops also red.
- **Baily's Beads:** an arc of bright spots that occur as the sun shines through the mountains and valleys of the moon. It happens fast as the sun pops back out at the end of the eclipse (or just before the eclipse).
- The **Diamond Ring Effect:** occurs briefly as the sun pokes back out after (or just before) the eclipse. Cover your lens (and eyes) quickly after snapping this.

Can we see the Eclipse here?

D.C. Metro Area: <u>Partial</u> Eclipse Only Monday, April 8, 2:04 p.m. – 3:20:31 p.m. - 4:33 p.m.

Phase	Time	Event	Direction	Elevation	
	14:04:16	Partial eclipse begins	\checkmark	Z	
	Mon, Apr 8	The moment the edge of the Moon touches the edge of the Sun is called first contact.	205°	56.3°	
	15:20:31	Maximum eclipse	\swarrow	7	
	Mon, Apr 8	The deepest point of the eclipse, with the Sun at its most hidden.	232°	47.1°	
	16:32:56	Partial eclipse ends	\swarrow	7	
	Mon, Apr 8	The edge of the Moon leaves the edge of the Sun.	249°	35.0°	

Expect images like this: (see later in presentation for settings)



Or you can Hit the Road:

Path of Totality Visibility



Key Factors

- Eclipse Duration (pretty good everywhere)
 - > 4 min 20 sec in Texas. 3 min 15 sec in Vermont.



Duration is longest near centerline of Totality path

- Weather
 - Want a high chance of clear skies at Totality
- Logistics
 - Lodging, food, water, bathrooms, place to set up.

How Long Will Totality Last?



Map adapted by NationalEclipse.com from original at eclipse.gsfc.nasa.gov. Map copyright Google, INEGI, ORION-ME. Eclipse predictions courtesy of Fred Espenak, NASA/Goddard Space Flight Center.

Historical Odds of Clouds Ruining it



NWS Weather & Cloud Cover Forecasts graphical.weather.gov/sectors/conus



Shows Weather & Opaque Cloud Cover Forecasts for the U.S.

- Left column has a +12Hrs
- Click that multiple times to advance to date and time nearest Totality. (Look below U.S. Map for Date & Time).
- Hover mouse over "Weather" or "Sky Cover" and either "7am" or "1pm" to see the map of weather or cloud cover forecasted.

Reference Cities near Centerline

Best US Cities to See the 2024 Total Eclipse April 8th, 2024

Colebrook, NH **Burlington, VT Plattsburg**, NY **Oswego**, NY Syracuse, NY

Buffalo, NY

Cleveland, OH

Jonesboro, AR

Erie, PA Akron, OH

Carbondale, IL **Cape Girardeau, MO**

Bloomington, IN

Little Rock, AR

Hot Springs, AR

Texarkana, AR

Caribou, ME **Presque Isle, ME**

Millinocket, ME Stowe, VT **Monteplier**, VT

Drives from Silver Spring:

- Akron, OH: 5.5 hours
- **Bloomington**, IN: 10 hours
- Poplar Bluff, MO: 14 hours
- Little Rock, AR: 15 hours
- Waco, TX: 21.5 hours



Broken Bow, OK

Dallas, TX Fort Worth, TX

Fredericksburg, TX

Waco, TX

Poplar Bluff, MO

Austin, TX

Eagle Pass, TX

Dayton, O

My 2017 Total Eclipse Location Procrastination Strategy

- I studied the weather and cloud cover forecast maps on the path of the eclipse between South Carolina and Kansas City <u>a few days before totality</u>.
- I settled on Tennessee as being the best odds and got a reservation in Knoxville <u>outside the path of totality</u>.
 i.e. a big city with *hotel vacancies*.
 (there were **no** vacancies anywhere inside the path).



- I arrived the day before totality at my hotel in Knoxville. I then scoured the internet for good places near centerline. **Facebook was very useful in finding eclipse events in small towns**. But the easiest ones to find were expected to overflow with parking shuttles, celebrities, and news coverage. People were selling space in their yards to watch from no thanks.
- One tiny town on the centerline had an eclipse event for a \$5 parking fee with porta johns, food, water, and a large space to set up in. I drove an hour from Knoxville (before sunrise) to be first in line to park. It was perfect in every way.
- I will try the same thing in April.

Narrowing it Down – Detailed Maps



Detailed maps of path in all states: nationaleclipse.com/maps.html

Details on Eclipse Timing from any Location

www.timeanddate.com/eclipse/map/2024-april-8



Site has interactive map – click to drop pin on location. Gives duration of totality, timings, and average cloud & weather forecast data.

Logistics

- Have a car filled. It is key for changing location at the last minute with the weather/clouds.
- I did like photo below in 2017. Operated out of the back of my Honda Pilot (SUV).



I brought:

- Folding chair
- Sunshade (I had a beach umbrella)
- Water & Food
- Duct Tape & Tools
- Sunscreen & Bug Spray (not Deet)
- Hat & Sunglasses

The Eclipse Event Venue had:

- Porta Johns
- Food for sale
- Water
- Souvenirs!

Traffic

- Traffic could be an issue. People travel to an eclipse site over a few days, so traffic before the eclipse is not usually a problem. The problem becomes traffic after the eclipse when everyone is leaving at the same time.
- Immediately following the "Great American Eclipse" in 2017, travelers got stuck in the "Great American Traffic Jam" as millions of people hit the highway.



Watching the Eclipse

- You will need Solar Eclipse Glasses to watch with. Need to be ISO Certified name brand.
 - Lists for safe glasses, camera filters, and binocular filters: <u>eclipse.aas.org/resources/solar-filters</u>
 - Buy Early!!! Suppliers may run out.



\$12.95 for five-pack





icstars.com/Store/daystar/2023-eclipseequipment/universal-lens-filter-50mm-aperture-bino.html

Gear

- Camera & Long Focal Length Lens (>200 mm)
 - Maker sure sensor is clean no dust.
- ND 5 Solar Filter for Lens
- Tripod (for longer shutter speeds and/or lots of images)
- Keychain flashlight for emergency
- Towel/clothespin to cover camera & your head or Hoodman Loupe to see Live View in glare
- Remote Shutter Release/Intervalometer (for longer shutter speeds and/or lots of images)

e.g. Vello Shutterboss II \$49.95



Pick your Lens: Lens Focal Length

This is how big the sun will appear with your camera with the following lens focal lengths in Crop Sensor and full-frame:



A 1.4x teleconverter would multiply the sun's size for a shorter lens.

Lens Solar Filters (buy early!)





e.g. Daystar ND 5 Filters:

- 65-80 mm aperture - Fits over outside diameters of 65-89 mm
- 90mm aperture - Fits over outside diameters of 85-109 mm
- \$29.95 each



Screw-on ND 5 = 16.6 Stop glass camera lens filters. E.g. *NiSi Solar Filter Pro Nano UV/IR Cut ND100000 Filter*

- 72 mm: \$95
- 77 mm: \$99
- 95 mm: \$159

Cons: Expensive. Slow to Remove when Totality occurs.

What if the Filters are the wrong sizes? MacGyver it.

Paper cup with bottom removed

95 mm solar filter 132 mm lens hood

\$

Cardboard lens hood cover, taped to lens hood.

Field-Surgery with a paper cup, a sheet of cardboard, a knife and electrical tape.

Home > Photography > Lens Filters > Neutral Density Filters > Solid Neutral Density Filters > NiSi Nano IRND Filter

(hole cut to pass paper cup through – seal edges of hole light-tight)

NiSi Solar Filter Pro Nano UV/IR Cut ND100000 Filter (100 x 100mm, 16.5-Stop)

BH #NIP100ND50 • MFR #NIP-100-ND5.0 | ★★★★★ 1 review | 4 Questions, 8 Answers

Fit in a square filter-holder or Make your own slide-over lens cover, and cut filter to fit.



In Stock \$129.00 Reg Price \$184.00 Instant Savings \$55.00 Limited supply at this price

Save the Tax with the **payboo** credit card.^{*} Learn More

Pay in 4 interest-free payments of \$32.25 with PayPal. Learn

Important Notice This item is nonreturnable



Photography Settings

- Pre-focus on infinity, and turn off Autofocus. Tape the Focus & Zoom Rings so they won't move.
- Turn off Vibration Reduction/Image Stabilization
- Turn on 3x3 display grid, if you have one. Helps keep sun centered.
- ISO of 100 or 200
- Image Type to RAW or RAW + JPEG
- White Balance = Daylight
- Manual Mode
- Set Aperture at the sharpest, e.g. ~ two stops down from wide open. Usually f/8 should be good.
- Find shutter speed for Partial Eclipse with 5ND Filter.
- Can select shutter speeds to match desired Total Eclipse solar phenomena: Corona, Chromosphere, Prominences, ...
 - Bracket multiple shutter speeds to get 5-7 of them.
- Set camera Interval Timer or external intervalometer to go off regularly, e.g. every ~1-2 seconds. Must be greater than sum total of bracketed shutter times. E.g. [1/4000 + 1/1000 + 1/250 + 1/60 + 1/2 sec]

Shutter Speed Selection

	ISO		f/Number								
	25		1.4	2	2.8	4	5.6	8	11	16	22
	50		2	2.8	4	5.6	8	11	16	22	32
	100		2.8	4	5.6	8	11	16	22	32	44
200			4	5.6	8	11	16	22	32	44	64
	400		5.6	8	11	16	22	32	44	64	88
	800		8	11	16	22	32	44	64	88	128
	1600		11	16	22	32	44	64	88	128	176
	Eclipse Feature	Q	Shutter Speed								
	Partial ¹ - 4.0 ND	11	-	-	-	1/4000	1/2000	1/1000	1/500	1/250	1/125
Filter 🔶	Partial ¹ - 5.0 ND	8	1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15
C	Baily's Beads ²	11				1/4000	1/2000	1/1000	1/500	1/250	1/125
	Chromosphere	10			1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60
	Prominences	9		1/4000	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30
	Corona - 0.1 Rs	7	1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	1/8
)	Corona - 0.2 Rs ³	5	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2
No Filter ≺	Corona - 0.5 Rs	3	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec
	Corona - 1.0 Rs	1	1/30	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec
	Corona - 2.0 Rs	0	1/15	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec
	Corona - 4.0 Rs	-1	1/8	1/4	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec
	Corona - 8.0 Rs	-3	1/2	1 sec	2 sec	4 sec	8 sec	15 sec	30 sec	1 min	2 min

Instructions

Choose the ISO speed in the upper left column. Next, select the f/number of the lens or telescope (on same line as ISO). Finally, drop straight down to the bottom table to get the correct exposure for each feature of the solar eclipse.

Dennis' 2017 Examples







Corona



Diamond Ring

Tanya's 2017 Examples



f/8, and range of shutter speeds (most extensive corona, with sun breaking through forming the "diamond ring.")

Partial Eclipse Photography

- You must use a ND 5 solar filter in front of your lens right up until Totality.
- Really don't need a tripod unless you want to maintain a composition of your sequence in post using interval shooting.
- Same settings as previous Settings page, but a single shutter speed is fine. E.g. ~1/500 sec with f/8 and ISO 100.

Practice at Home

- Affix solar filter to your lens
- Mount camera on your tripod, point it in the general direction of the sun.
- Look at the shadow of your camera on the ground. Adjust the ballhead so that the shadow of the lens disappears entirely into the shadow of the camera body. That will tell you that the lens is aligned in a straight line between the camera and the sun.
- At this point, the viewfinder will be pointed down, making it tricky to look through it (optical viewfinder) or at it (Liveview). This is exacerbated by the fact that you're now looking in the direction of the sun.
- Sit on the ground and look up through the viewfinder to see if you can find the sun's disk. Or try to find the sun's disk in LiveView.
 - You should get a small stool or short chair to sit on
- Take a towel bath towel size and drape it around your camera. Secure it with a clothespin, so you're encased in a curtain surrounding your camera like an old-fashioned camera hood. Once you do this, you can reasonably comfortably look up into either the viewfinder or LiveView screen.
- Turn on the 3x3 grid view on the LiveView screen to help you center the disk on the screen
- Kick off interval shooting recenter, recenter, recenter, recenter ...

If "My Lens Keeps Dropping"

So, during your practice you may have found that loosening the ballhead to adjust your big lens to re-point at the sun results in your lens not behaving. It might want to pivot down at its front or it might just be difficult to control while you are seated or bent over, looking through the viewfinder or at the Live View. This can be a time killer on Totality Day.



A Gimbal Tripod Head

A **Gimbal Tripod Head** may be your answer. (I love mine). It replaces your ball head on the tripod. The lens' Arca Swiss mounting plate locks into the gimbal's clamp. It is adjusted to balance the lens perfectly. You can rotate the vertical and horizontal angles of your lens with one finger, and it will stay put. Great for photographing birds too. Reviews: <u>shuttermuse.com/best-gimbal-</u> tripod-heads/

From \$60 to >\$600

My \$100 Movo GH700 has worked well for years. It's a bit heavy at 3.1 lbs. The GH800 is \$180 and 2.75 lbs.

My Issues



1) Totality gets dark!

My intervalometer cable popped out of my camera and I couldn't see what happened. I lost 30 precious seconds until I started using the shutter button instead. A tiny red keychain light would have saved the day.

(a bigger flashlight would have gotten me beat up)



- 2) I discovered a dust blob on my brightest images. Fortunately, wasn't in the best part of the images. That was a near-miss.
- 3) I didn't bring a Gimbal Tripod Head I should have.
- 4) Try to automate as much as you can. You want to WATCH IT!

Other Options



Wide angle with a 28mm lens and tripod .





Leaf Shadows



Project Through a Lens

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