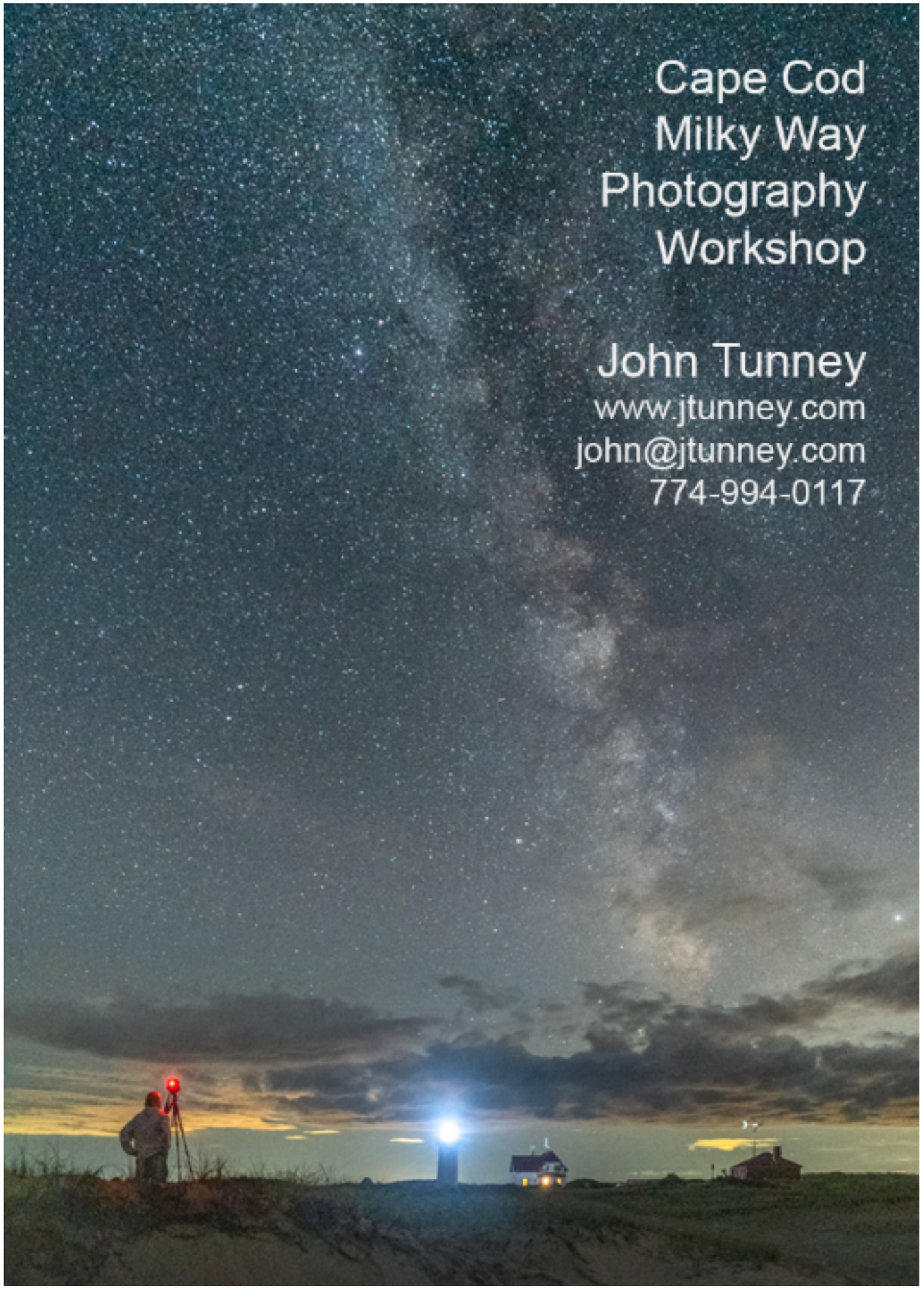
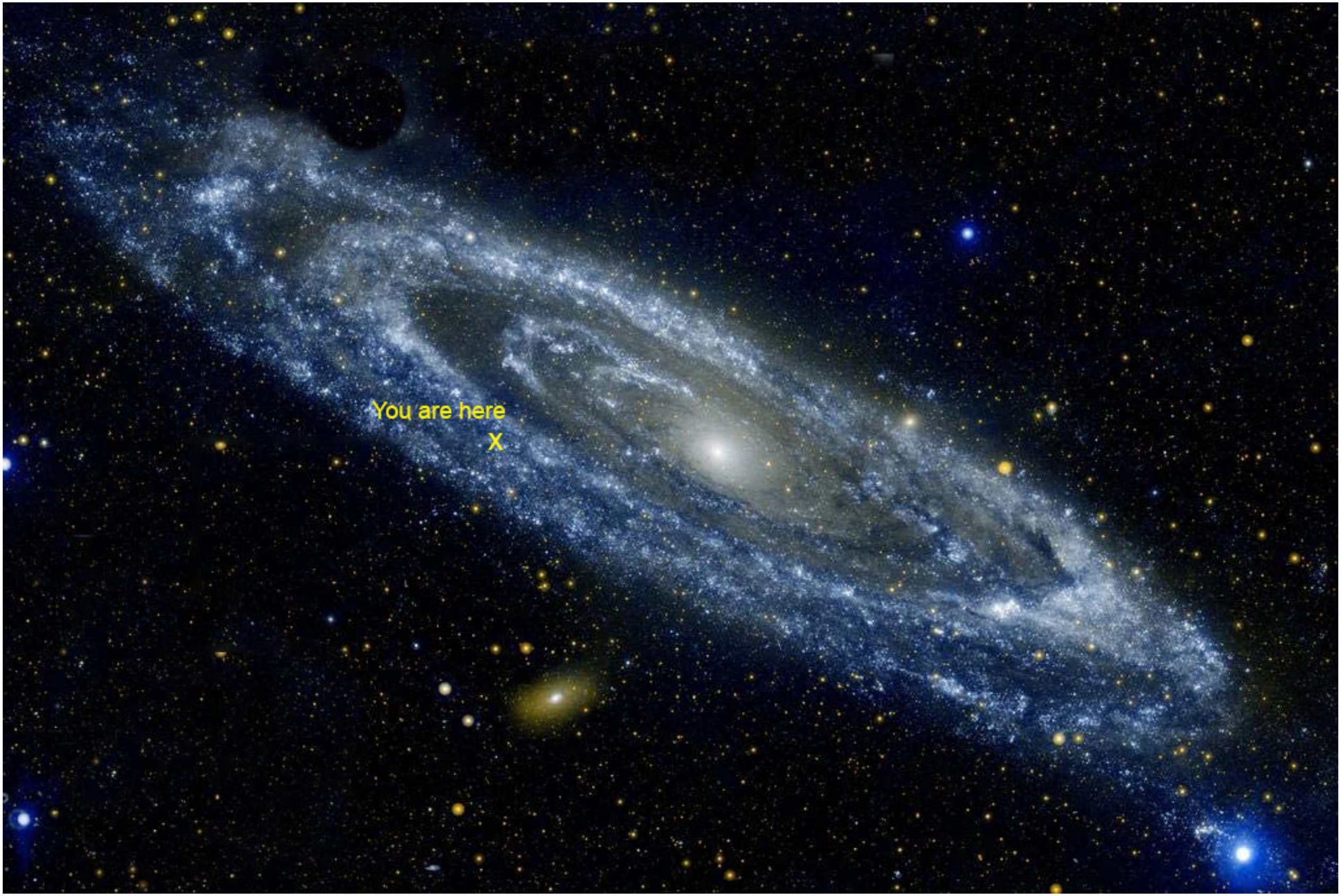
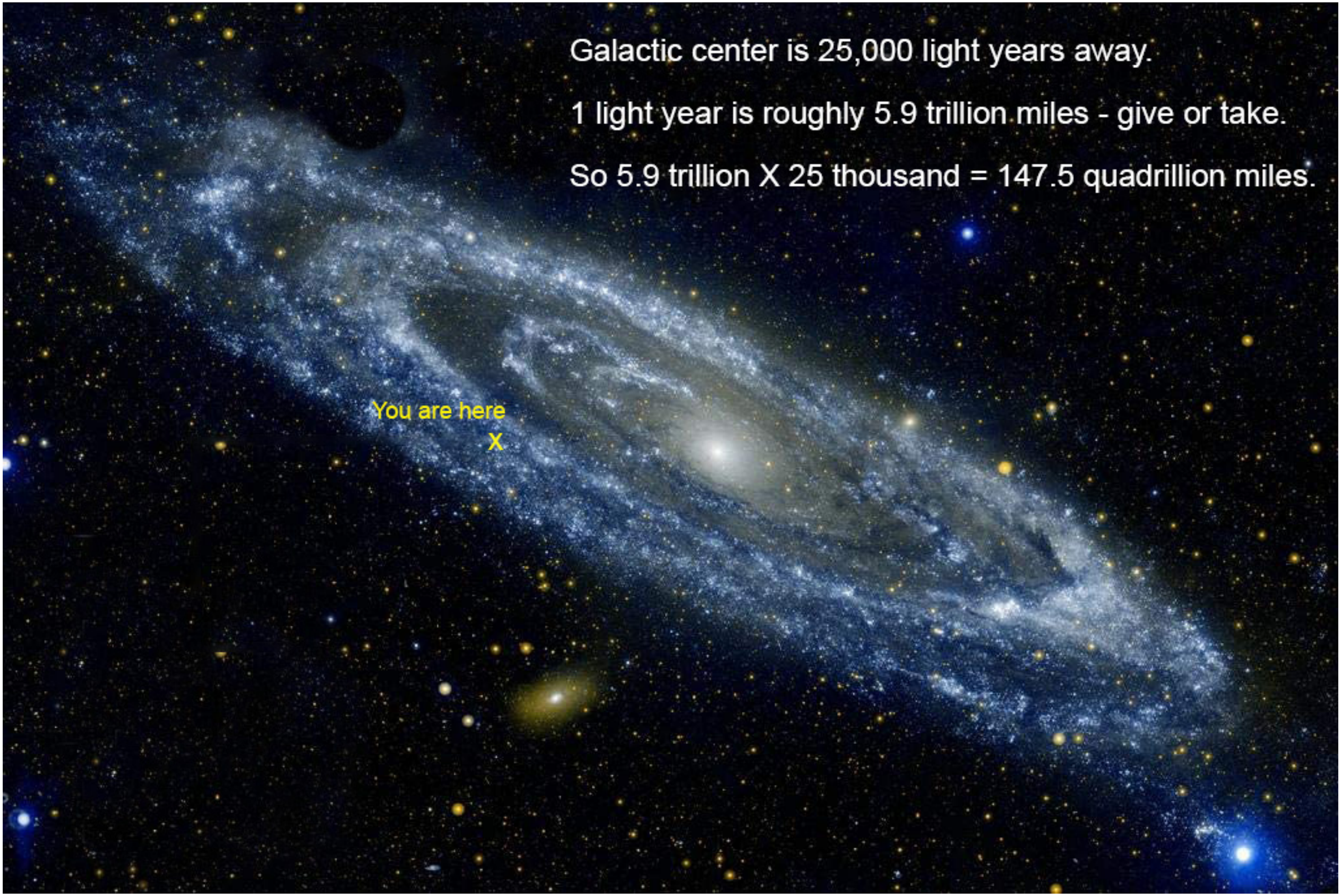
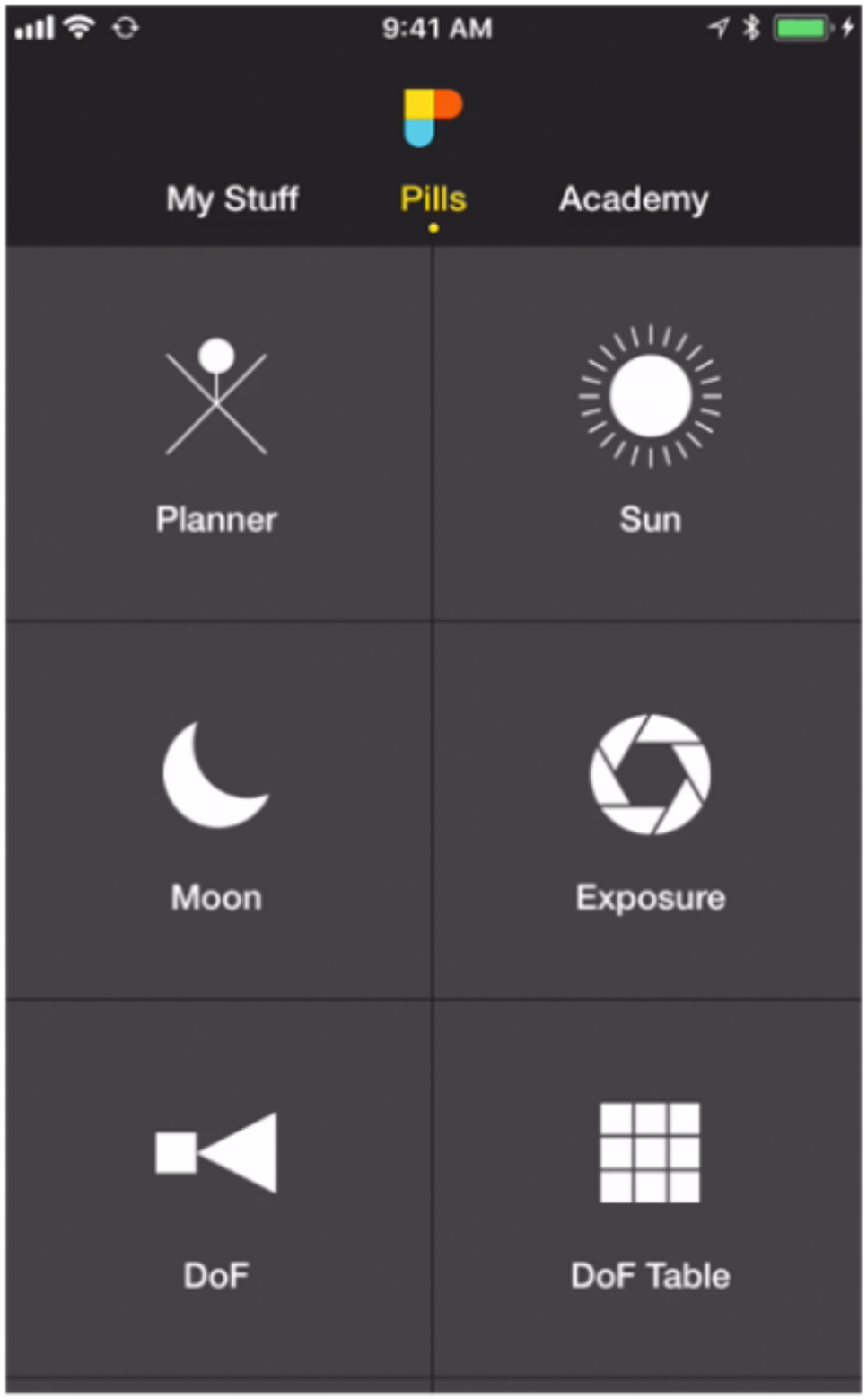

Cape Cod
Milky Way
Photography
Workshop
John Tunney
www.jtunney.com
john@jtunney.com
774-994-0117

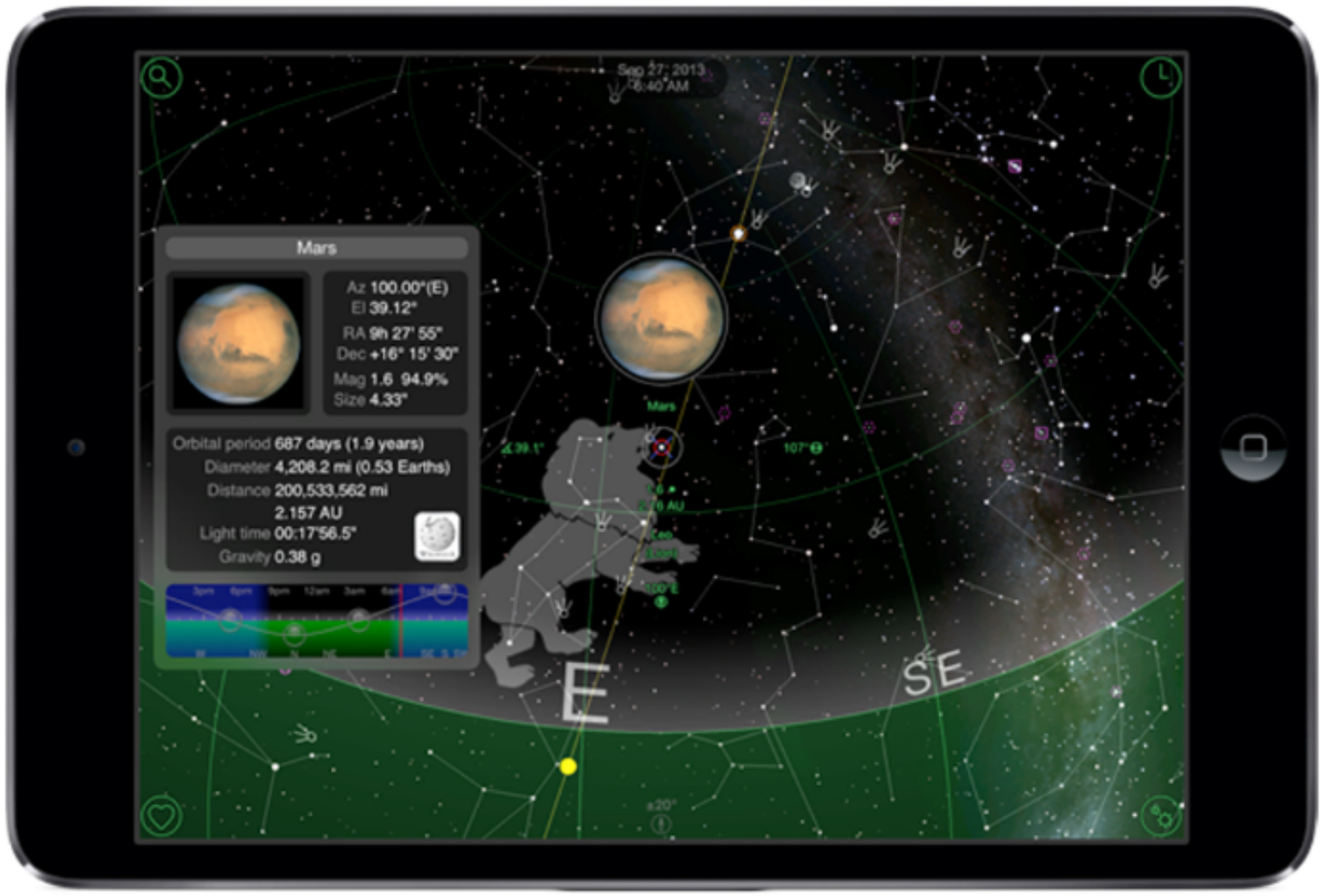
How to Find the Milky Way


You are here
X


Galactic center is 25,000 light years away.
1 light year is roughly 5.9 trillion miles - give or take.
So 5.9 trillion X 25 thousand = 147.5 quadrillion miles.
You are here
X


9:41 AM
My Stuff
Pills
Academy
Planner
Sun
Moon
Exposure
DoF
DoF Table

PhotoPills


Sep 27, 2013
8:40 AM
Mars
Az 100.00°(E)
El 39.12°
RA 9h 27' 55"
Dec +16° 15' 30"
Mag 1.6 94.9%
Size 4.33"
Orbital period 687 days (1.9 years)
Diameter 4,208.2 mi (0.53 Earths)
Distance 200,533,562 mi
2.157 AU
Light time 00:17'56.5"
Gravity 0.38 g
Mars
E
SE

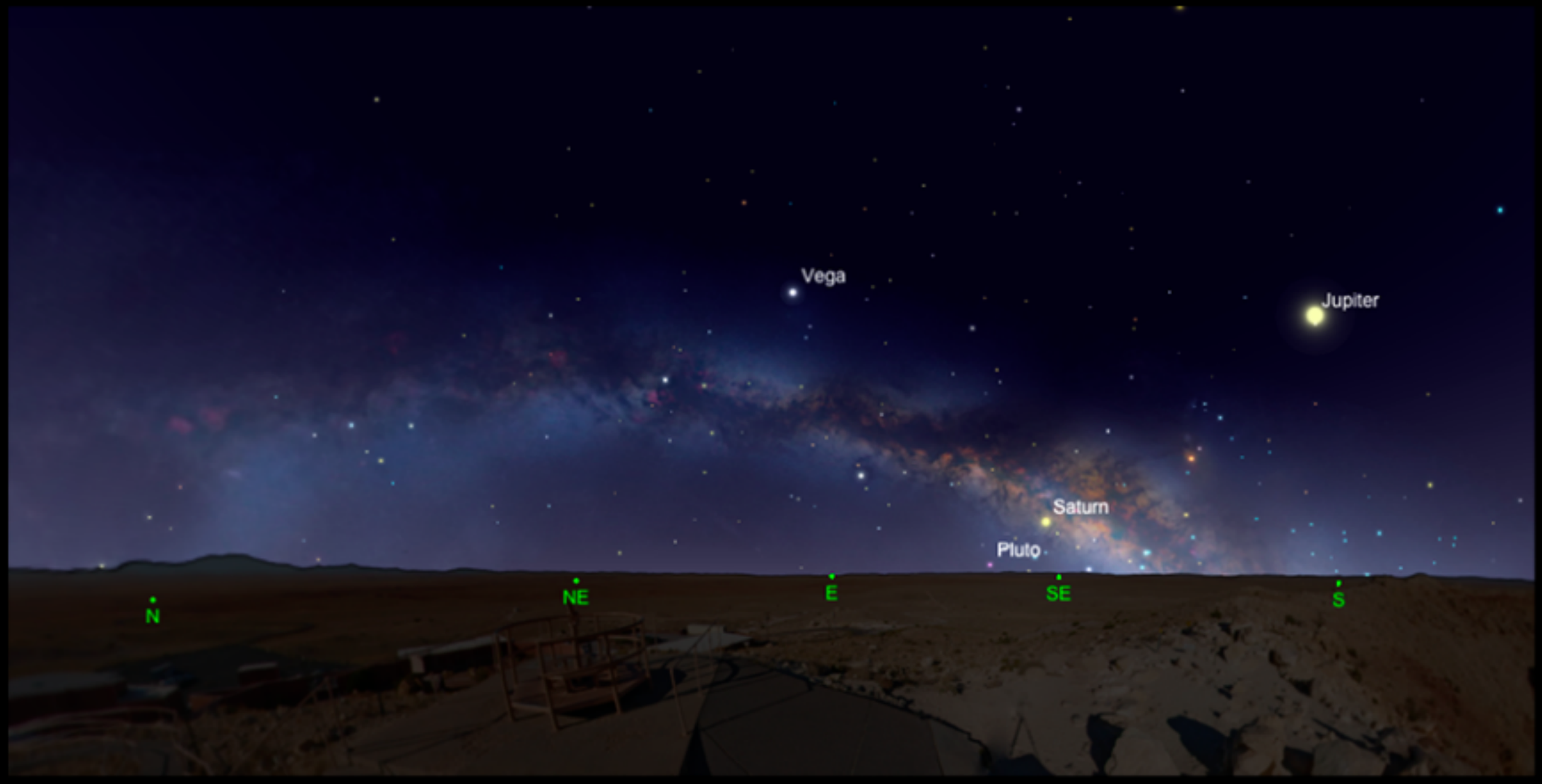
GoSkyWatch


Milky Way “season” is May-October
(Northern Hemisphere)
When galactic core is most visible
Fades in winter
June 6, 11:30pm, Nauset Beach

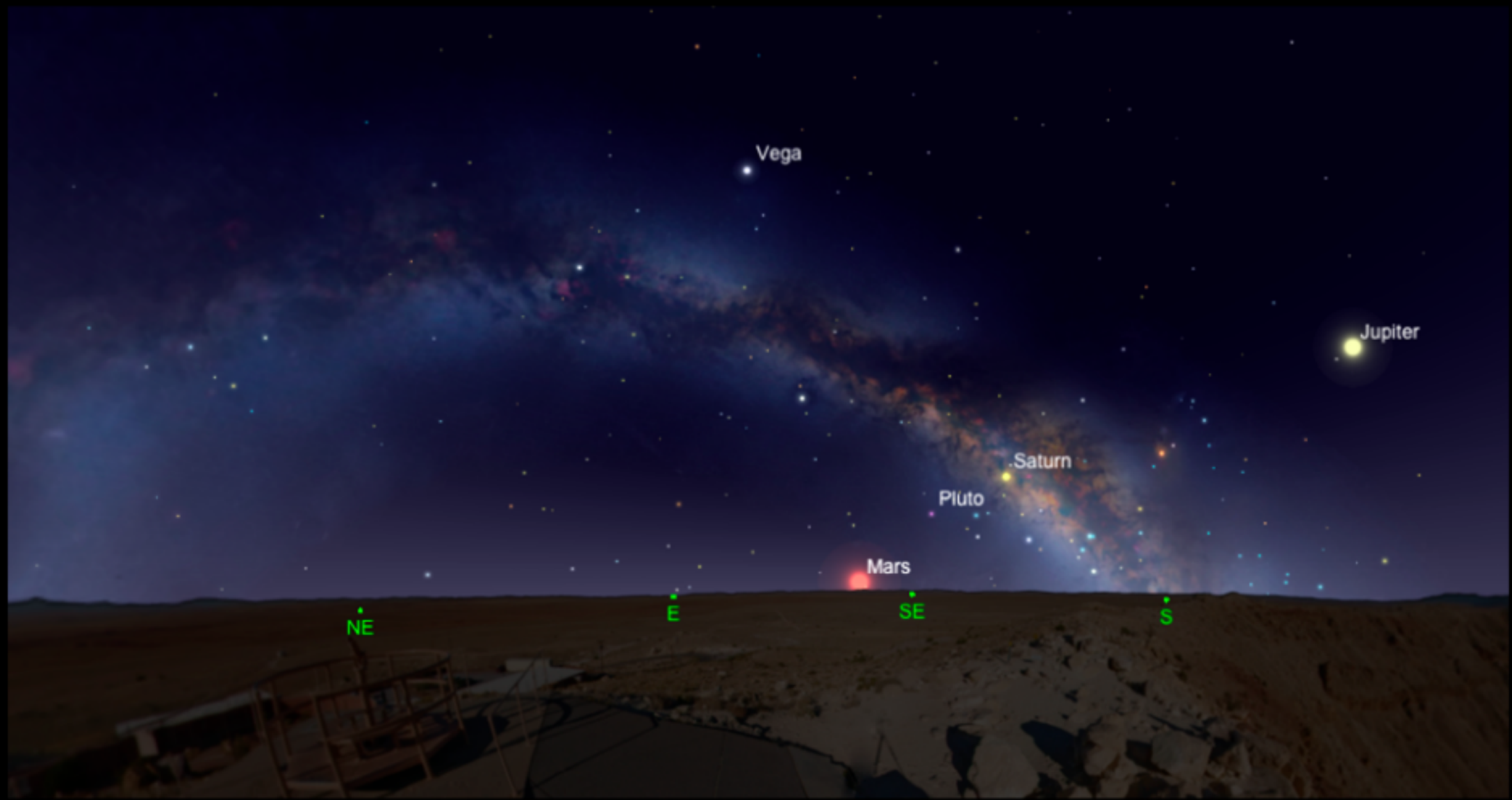
Milky Way arches north to south
Galactic core apears in the southeast, south & southwest

May 9
10 pm

Milky Way Rising



June 9
10 pm



July 9
10 pm

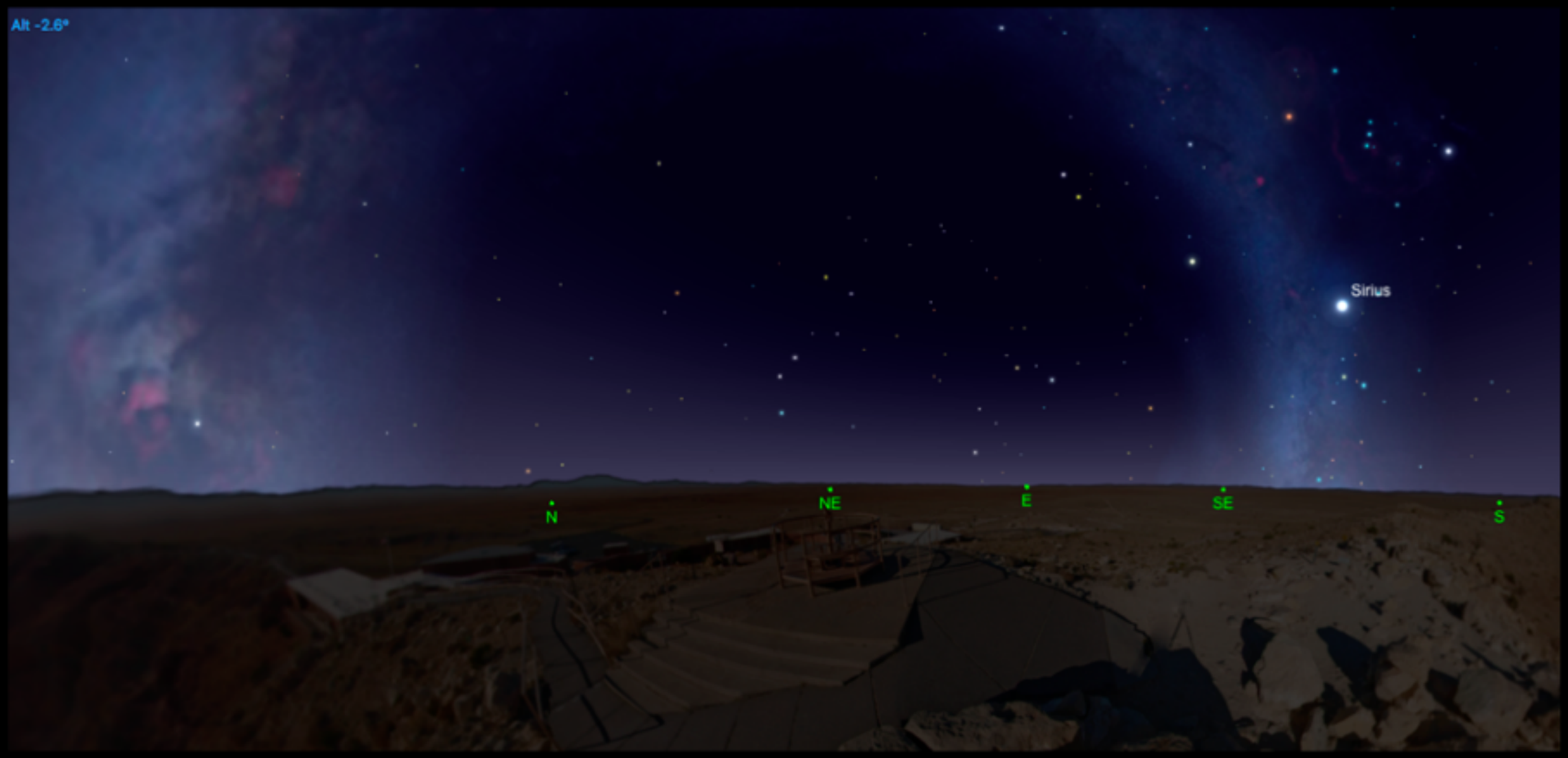
August 9
10 pm

September 9
10 pm

October 9
10 pm

November 9
10 pm

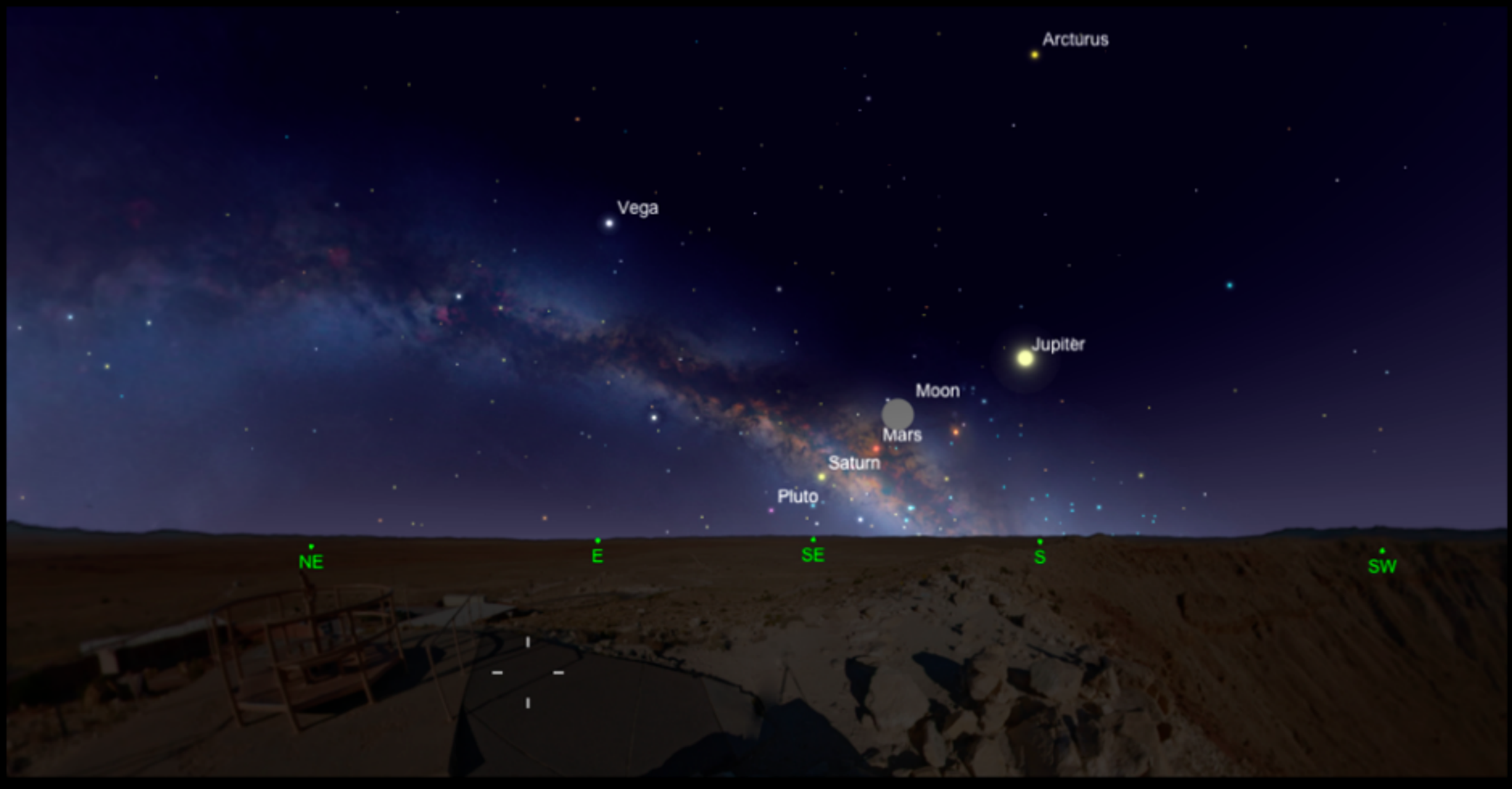
December 9
10 pm



January 9
10 pm

February 9
10 pm

March 9
10 pm



March 9

4 am

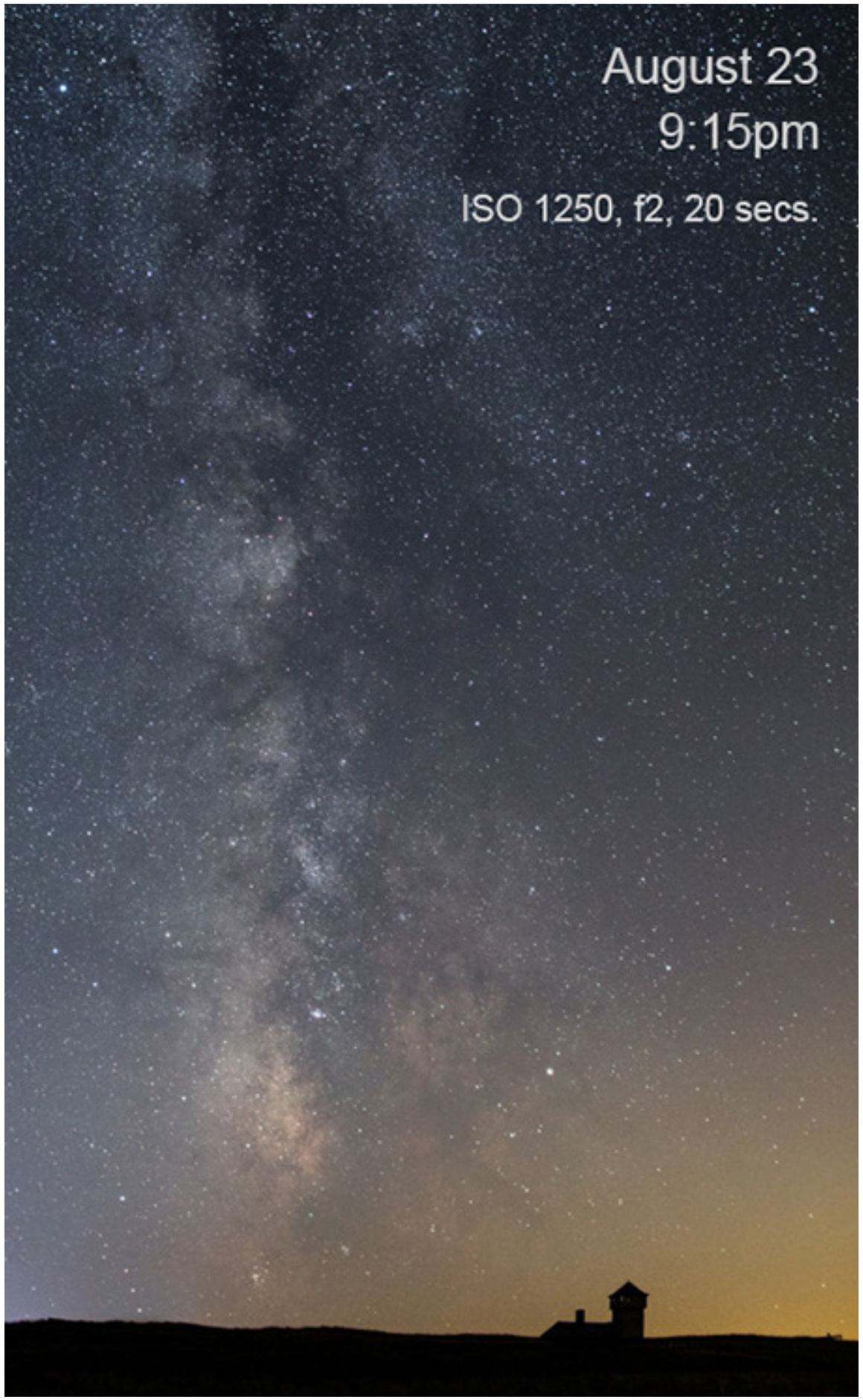
Core rises very late in late winter/early spring


May 14

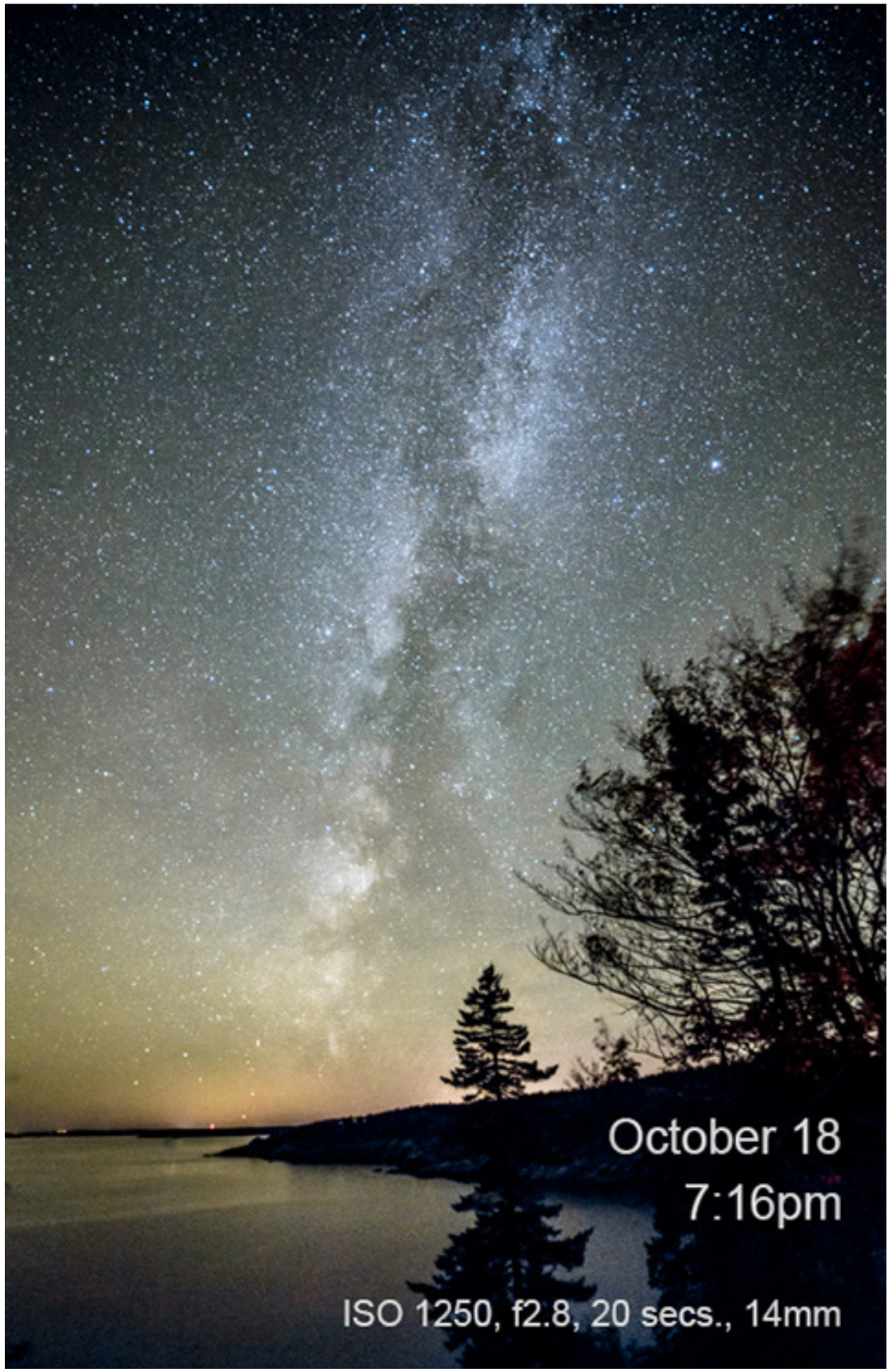

5/22/19


June 11, 11pm
June 12, 1:15am


July 24
9:30pm


August 23
9:15pm
ISO 1250, f2, 20 secs.


October 15
9:18pm
ISO 800, f2.8, 20 secs., 24mm

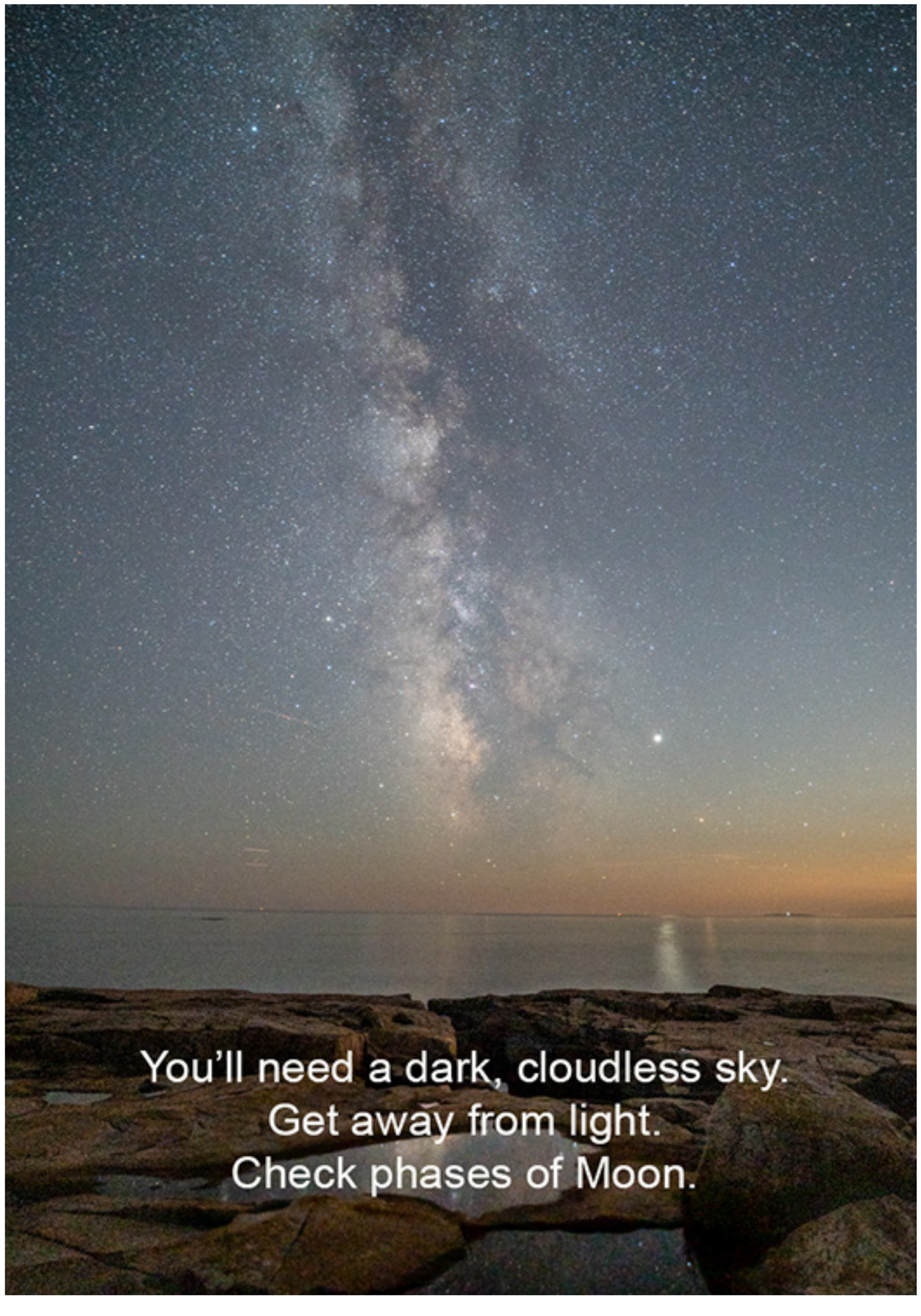

October 18
7:16pm
ISO 1250, f2.8, 20 secs., 14mm


October 18
8:21 pm
ISO 1250, f2.8, 20 secs., 14mm


November 3
11pm
ISO 2000, f2.8, 20 secs., 24mm


Looking south
August 29
9:35pm


Looking north
August 9
11pm


You'll need a dark, cloudless sky.
Get away from light.
Check phases of Moon.


Low moon (rising or setting)
and Crescent Moon
may be okay.

14mm, ISO 2500, f2.5, 20s ecs.

Camera Settings: The Short Answer

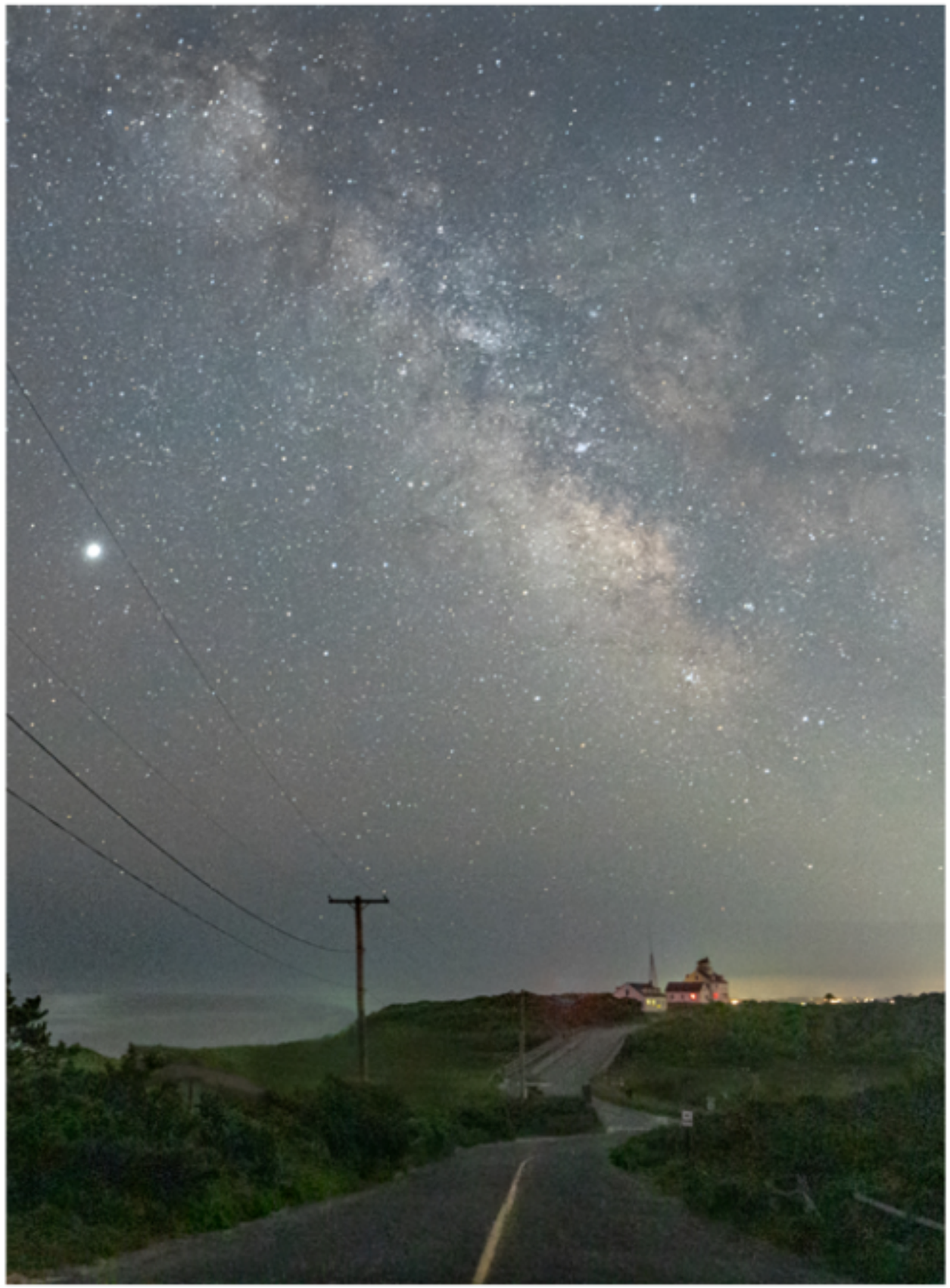
RAW

Manual Exposure

ISO 2000 +/-

F2.8 +/-

20 seconds +/-



ISO 2500, f2.5, 20 secs., 14mm

Camera Settings: The Long Answer

Shoot in manual mode

RAW

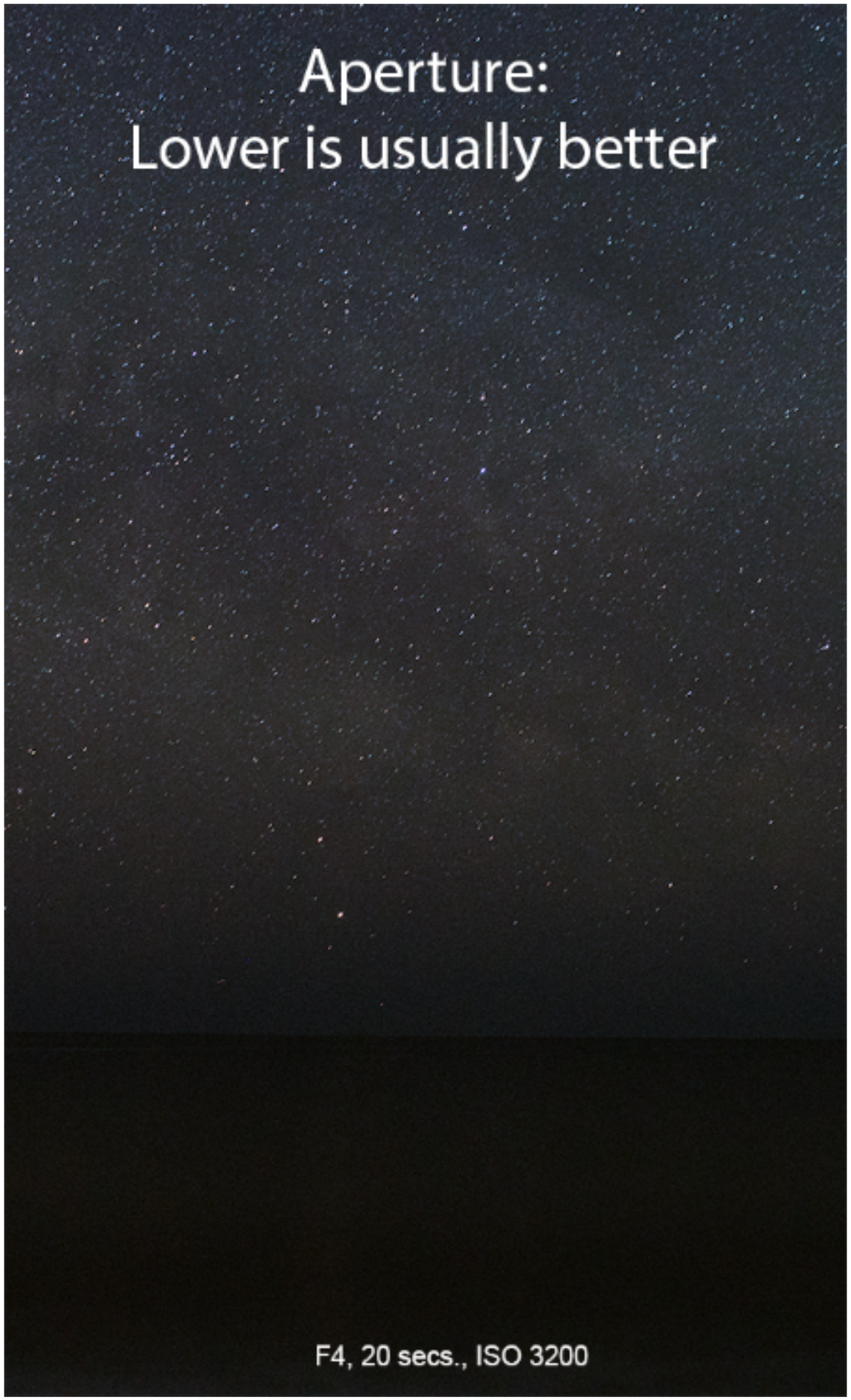
Auto White Balance

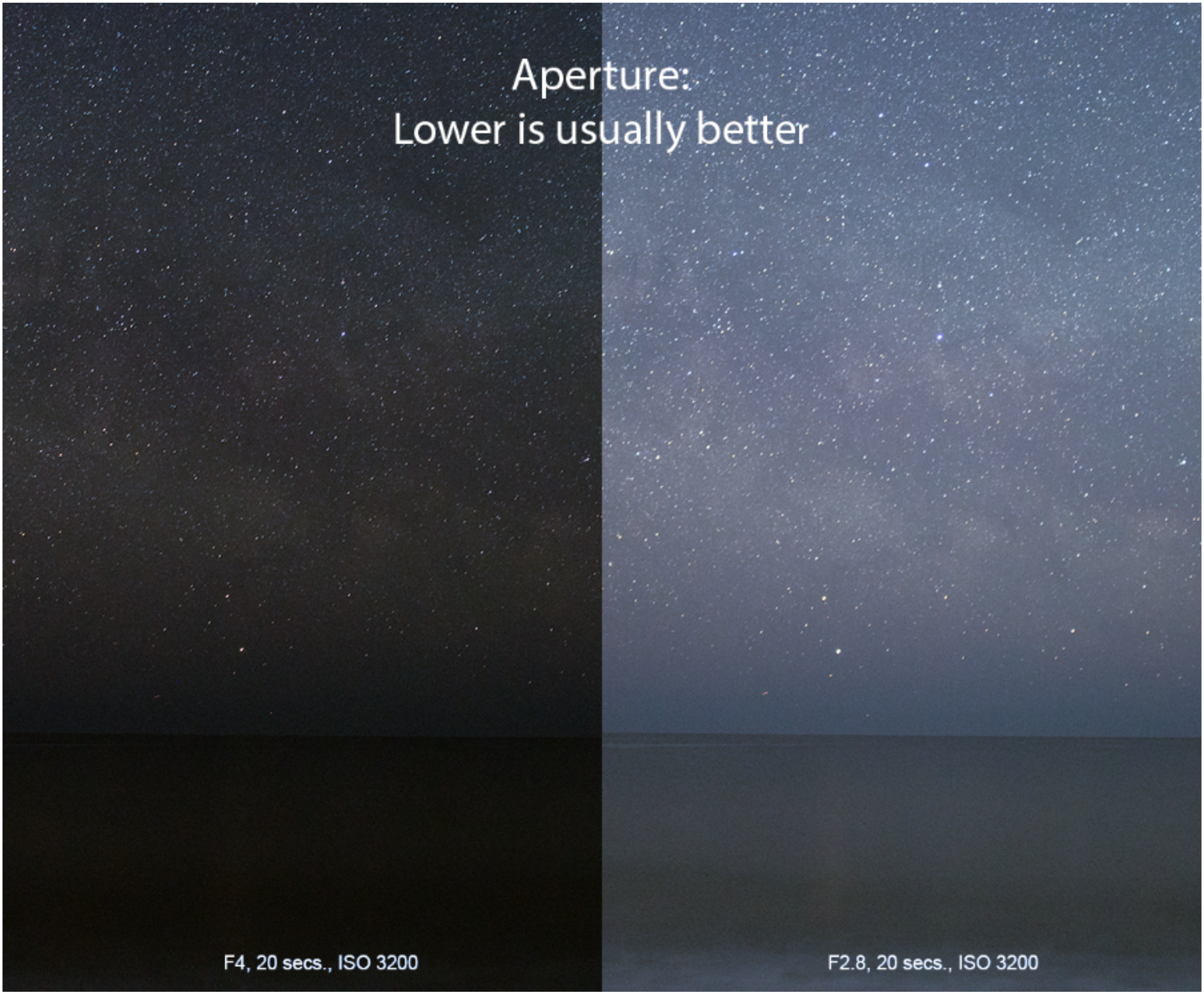
ISO: 1250-3200. Experiment.

Aperture: Lowest f-stop (if really fast lens - f1.4, 1.8, 2 - try increasing one or two stops)

Shutter speed:
10-25 secs. for full frame*
10-20 secs. for aps-c*

* Depends on resolution, focal length, sensor size, aperture


Aperture:
Lower is usually better
F4, 20 secs., ISO 3200


Aperture:
Lower is usually better
F4, 20 secs., ISO 3200
F2.8, 20 secs., ISO 3200

Shutter Speed and Star Shape

For stars that look like points, not dashes, use:

~~500 Rule~~

NPF Rule

The NPF rule

(35 x aperture + 30 x pixel pitch) ÷ focal length = shutter speed in seconds

Yes, there's an app for that

(PhotoPills)

Lens Focal Length and Camera Resolution Impact Shutter Speed

Camera:
Full frame, 24mp, F2.8

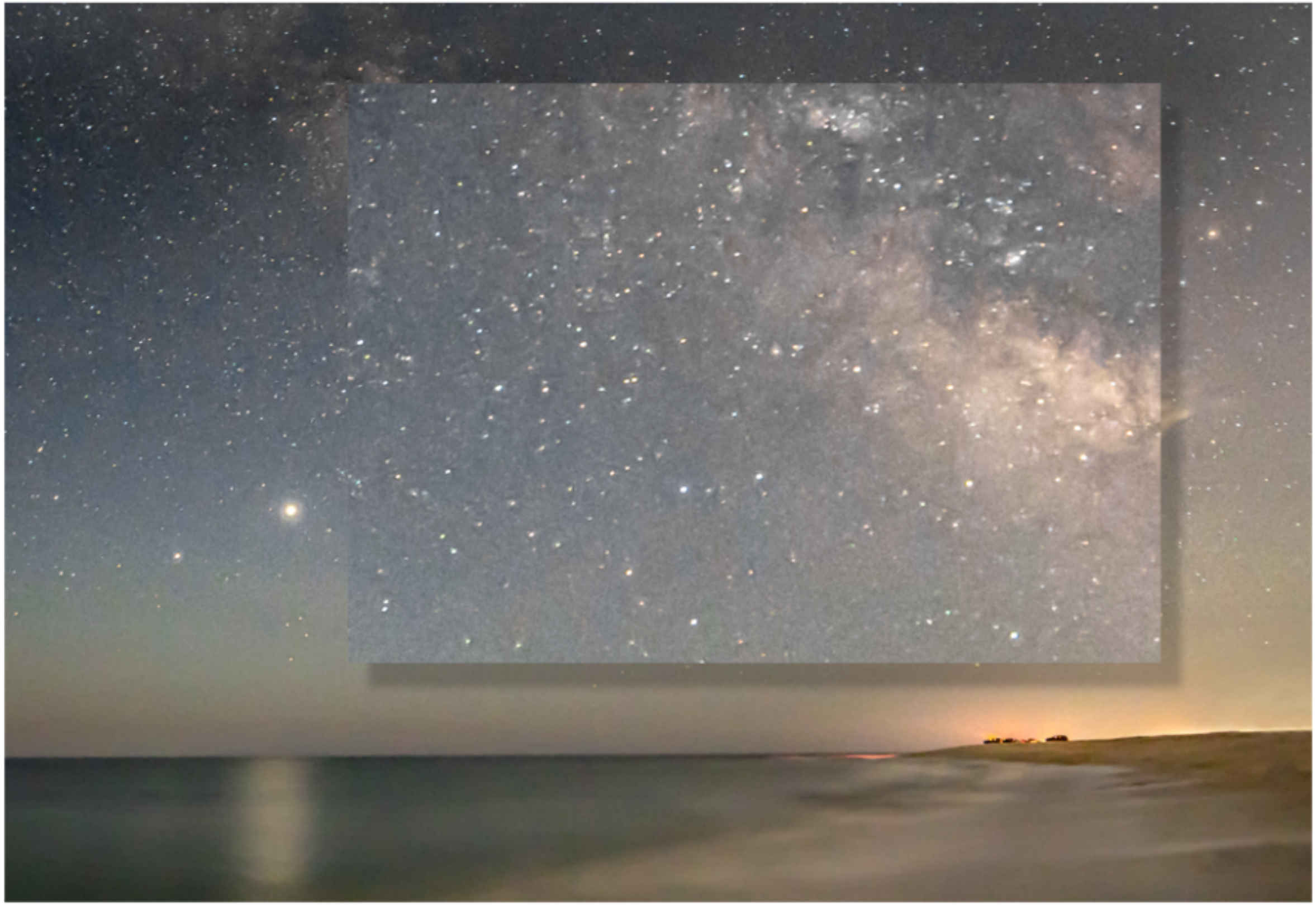
Focal Length	NPF vs 500
14mm	9s vs 36s
16mm	8s vs 31s
20mm	7s vs 25s
24mm	5s vs21s

Camera:
Full frame, 42mp , F2.8

Focal Length	NPF vs 500
14mm	8s vs 36s
16mm	7s vs 31s
20mm	6s vs 25s
24mm	5s vs21s

The lower the f-stop, the faster the shutter speed,
the sharper the stars

What I Do (usually): F2.8, 13-20 secs.



What I Do: F2.8, 13-20 secs.

ISO Invariance

Nikon D750, D850, Z series, D5500, D7000 series
Sony A1, A7 and A9 series
EOS R5 and R6
Pentax K-1
Fuji XT series

May not need to go beyond ISO 2000

Experiment

Test Your Camera

Go out at night

Manual exposure

Aperture: F4 or F2.8

Shutter speed: 20 seconds

Start at ISO 800

Go up to 6400

Process in Lightroom

How do they look?


Straight out of camera
ISO 800
F3.2, 20 secs.


ISO 1250
F3.2, 20 secs.


ISO 2500
F3.2, 20 secs.


ISO 3200
F3.2, 20 secs.


ISO 6400
F3.2, 20 secs.


ISO 25,600
F3.2, 20 secs.

Unedited
Canon 6D

ISO 1250
F3.2, 20 secs.

ISO 2500
F3.2, 20 secs.

ISO 3200
F3.2, 20 secs.

ISO 6400
F3.2, 20 secs.


Canon6D
Exposure +3-5
Shadows +60
ISO 1250
F3.2, 20 secs.


ISO 2500
F3.2, 20 secs.

ISO 3200
F3.2, 20 secs.

ISO 6400
F3.2, 20 secs.


ISO 800
F3.2, 20 secs.


ISO 1250
F3.2, 20 secs.


ISO 2500
F3.2, 20 secs.

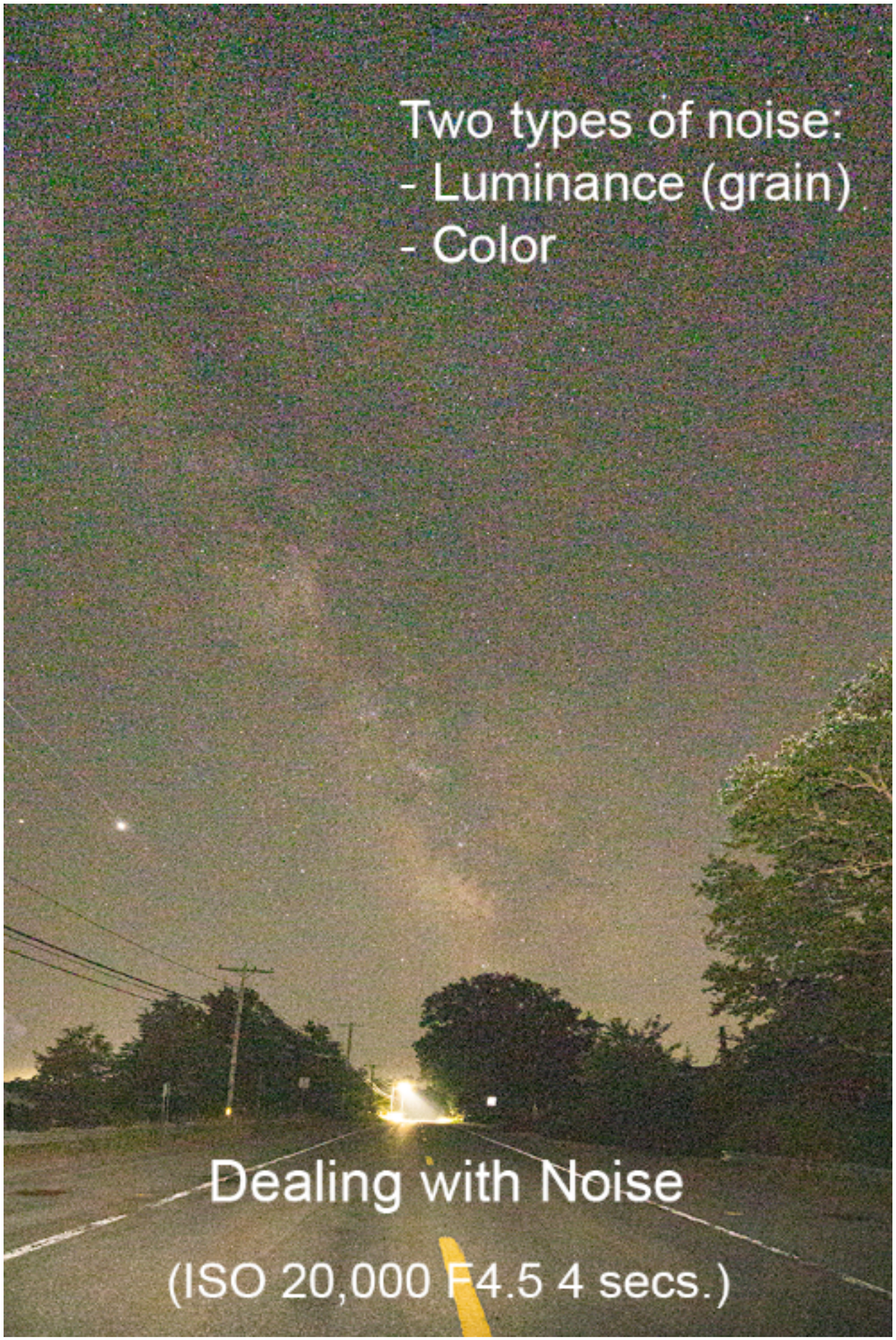

ISO 3200
F3.2, 20 secs.


ISO 6400
F3.2, 20 secs.


ISO 800
ISO 2500
ISO 6400


ISO 1250
ISO 3200
ISO 25600


Dealing with Noise
(ISO 20,000 F4.5 4 secs.)


Two types of noise:
- Luminance (grain)
- Color
Dealing with Noise
(ISO 20,000 F4.5 4 secs.)

Dealing With Noise: Options

Dealing With Noise: Options

1. Don’t worry about it.

Dealing With Noise: Options

1. Don't worry about it.

2. Adjust in post processing.
   - In Lightroom go to Detail panel, under Noise Reduction
     Drag Color slider all the way to right to 100
     Drag luminance slider to right, but watch for blurring of image
   - Use third-party software such as Topaz AI Denoise

Dealing With Noise: Options

1. Don't worry about it.

2. Adjust in post processing.
   - In Lightroom go to Detail panel, under Noise Reduction
     Drag Color slider all the way to right to 100
     Drag luminance slider to right, but watch for blurring of image
   - Use third-party software such as Topaz AI Denoise

3. Exposure Blending. Take one image with standard MW exposure for sharp stars. Take second image on Bulb for extra-long exposure for foreground (1 minute +/-). In Photoshop, replace stars in second image with stars from first.

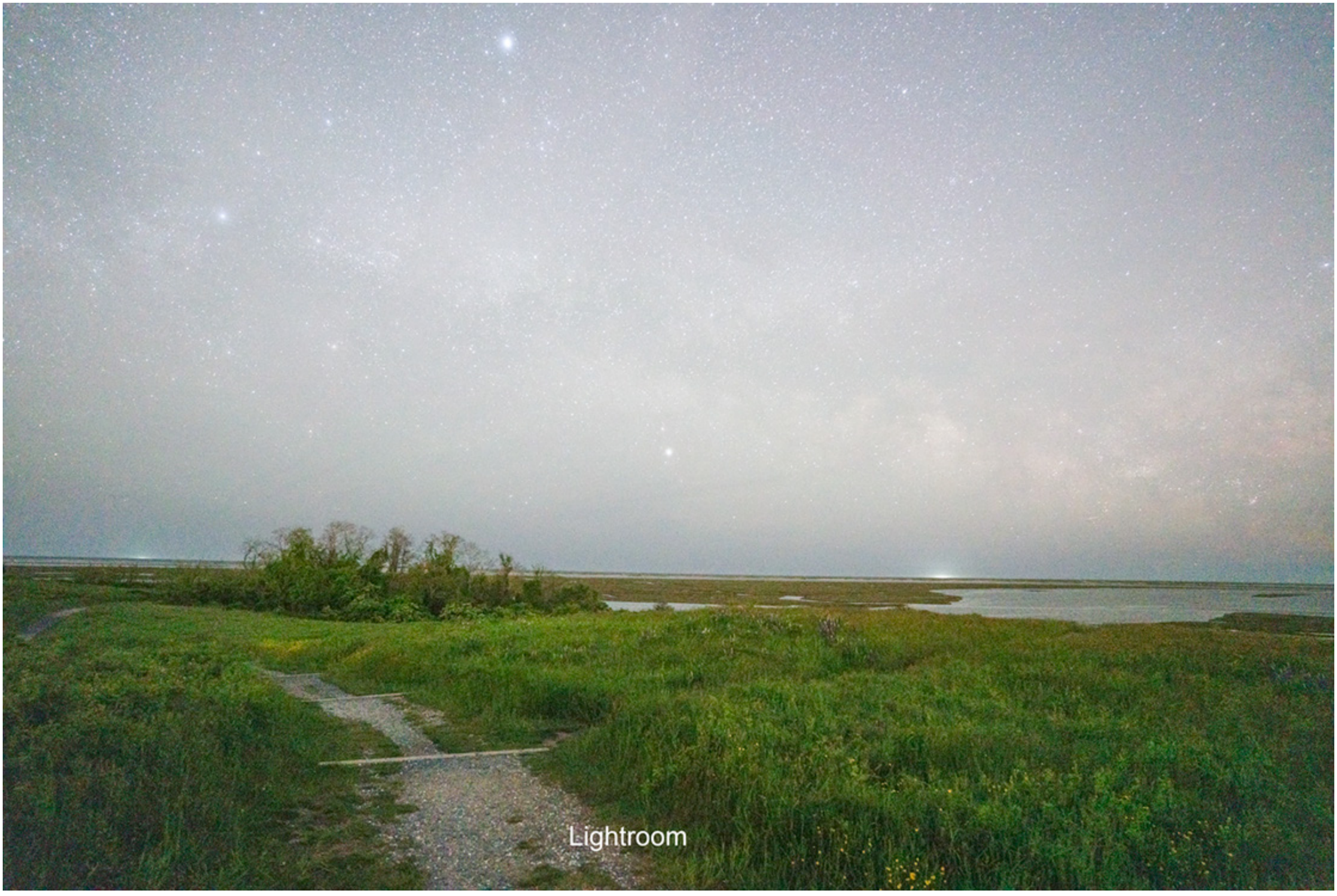
Dealing With Noise: Options

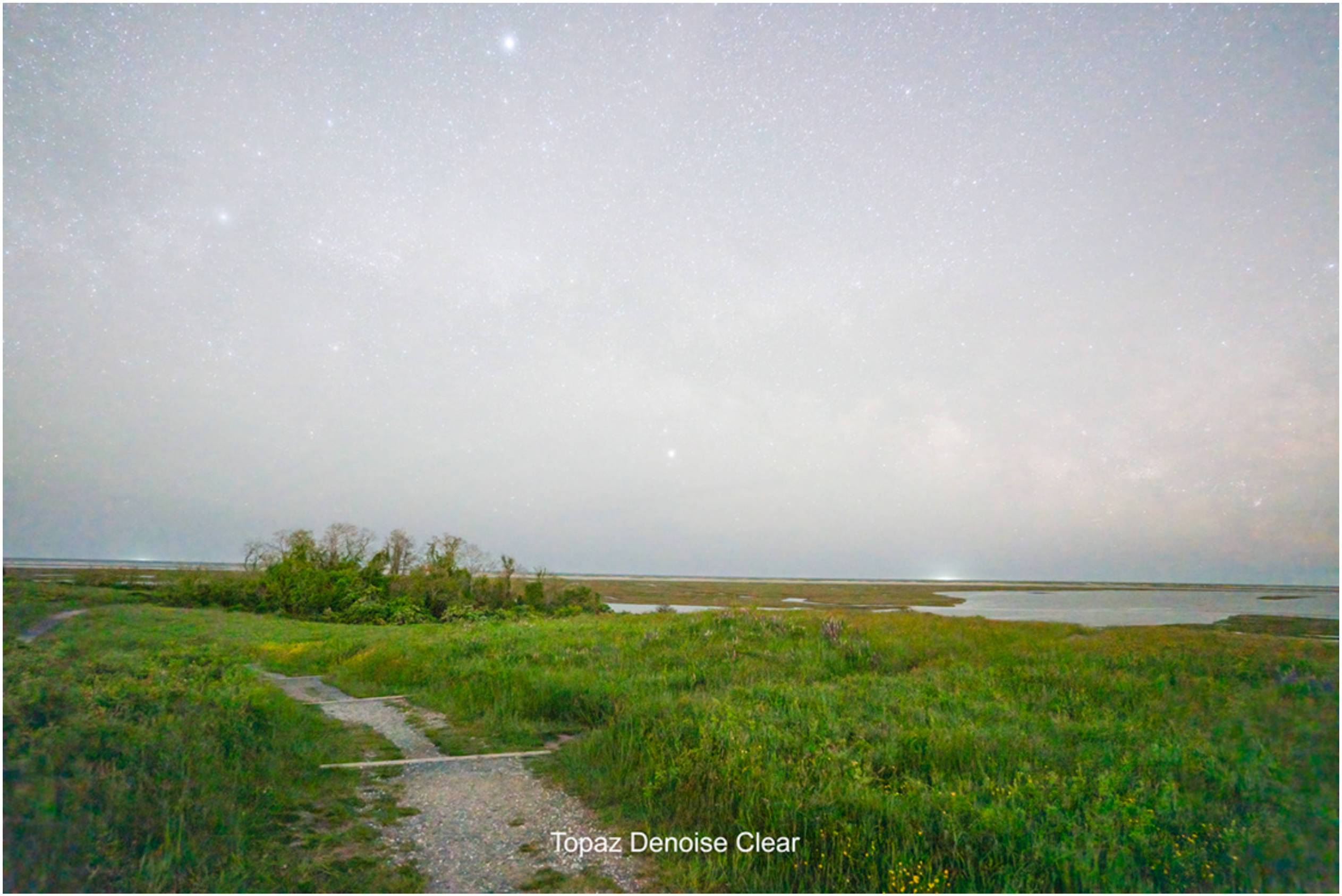
1. Don't worry about it.

2. Adjust in post processing.
   - In Lightroom go to Detail panel, under Noise Reduction
     Drag Color slider all the way to right to 100
     Drag luminance slider to right, but watch for blurring of image
   - Use third-party software such as Topaz AI Denoise

3. Exposure Blending. Take one image with standard MW exposure for sharp stars. Take second image on Bulb for extra-long exposure for foreground (1 minute +/-). In Photoshop, replace stars in second image with stars from first.

4. Use Starry Landscape Stacker or Sequator and stack images
   - take multiple (5-20) shots and then stack in software


Lightroom


Topaz Denoise Clear


Topaz AI Denoise Standard


Starry Landscape Stacker


Lightroom


Topaz AI Denoise Standard


Topaz Denoise Clear

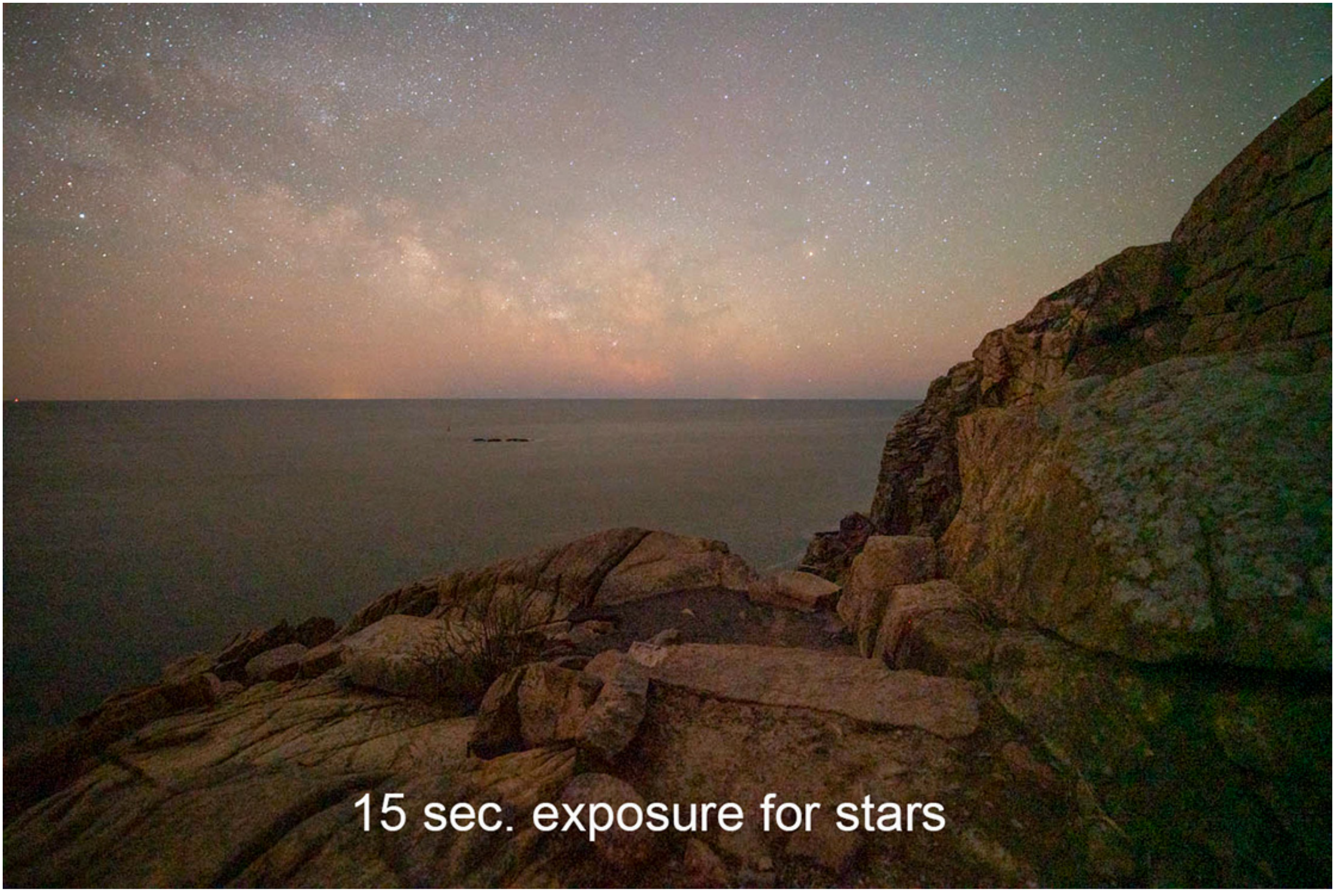

Starry Landscape Stacker

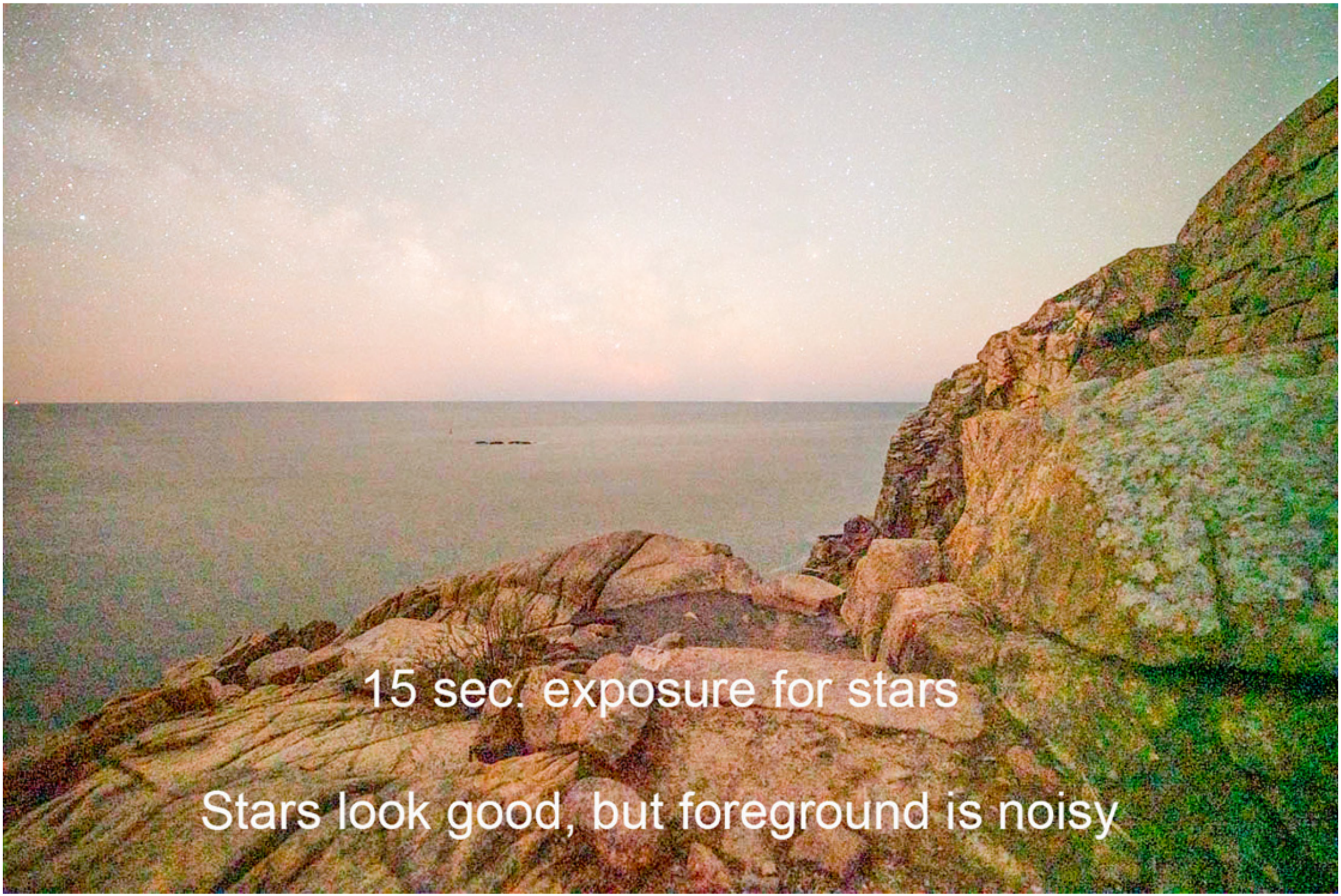
Exposure Blend/
Sky replacement

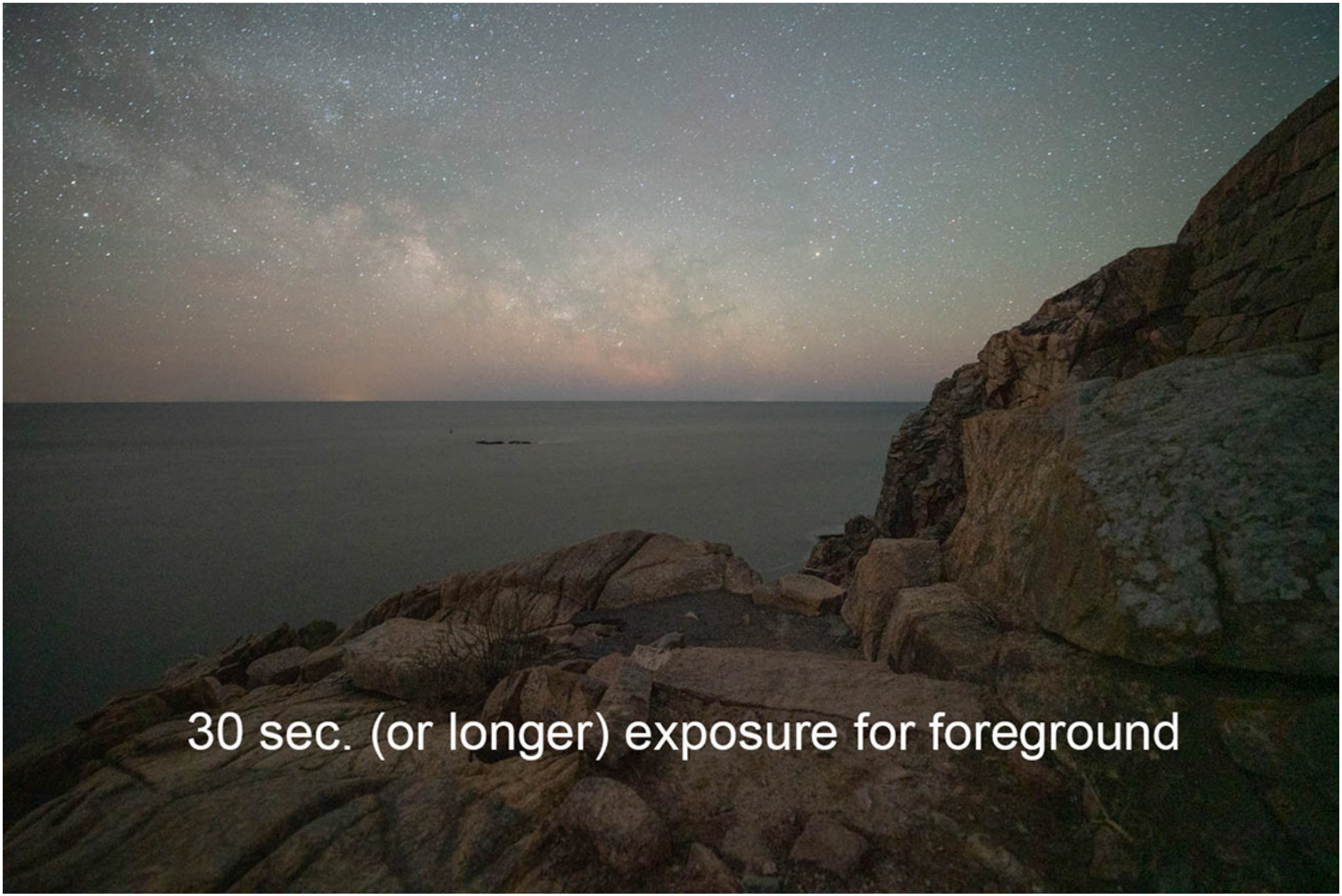
Two images
1 standard exposure for stars

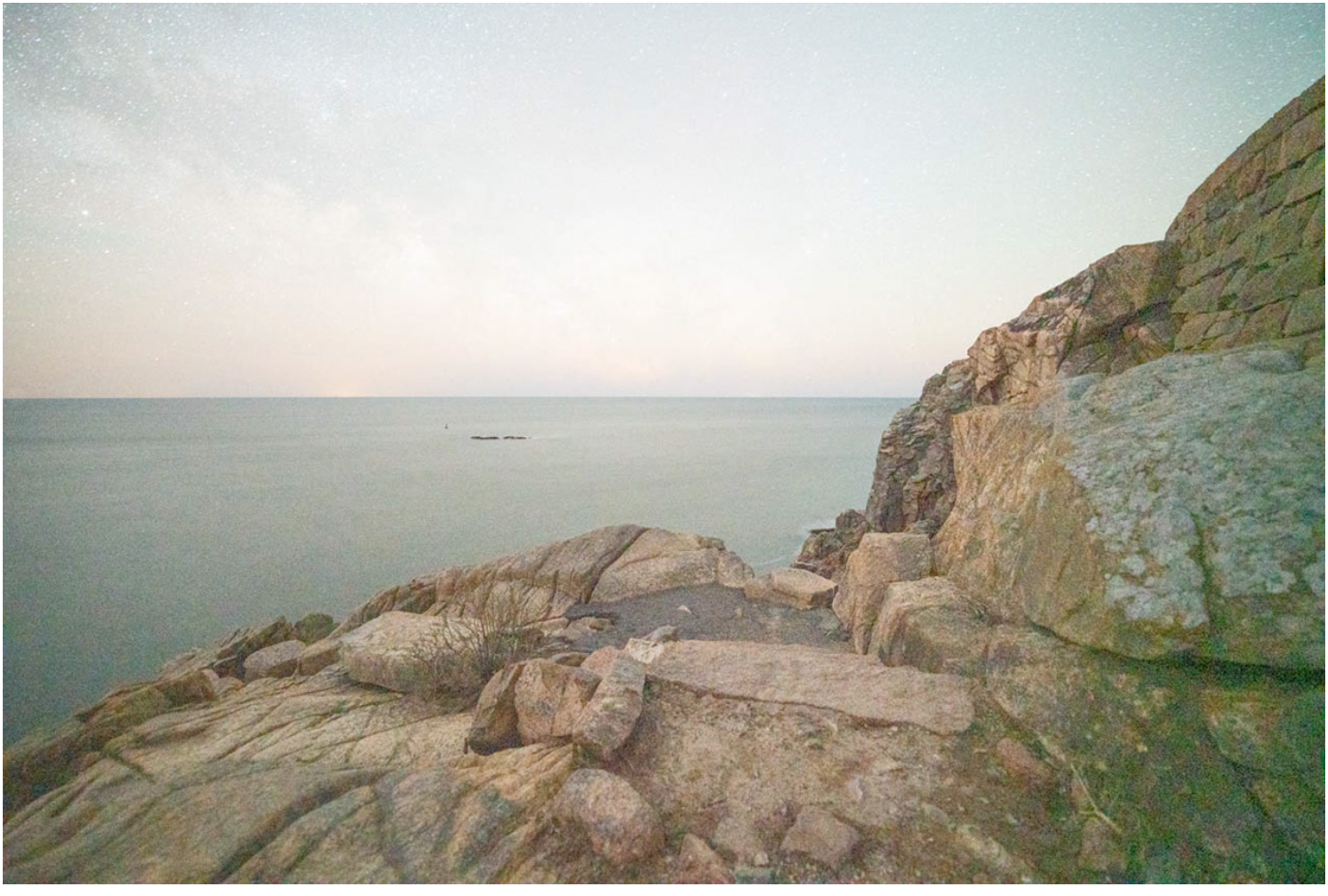
1 long (30+ secs. for foreground)

Replace sky of second
with sky from first

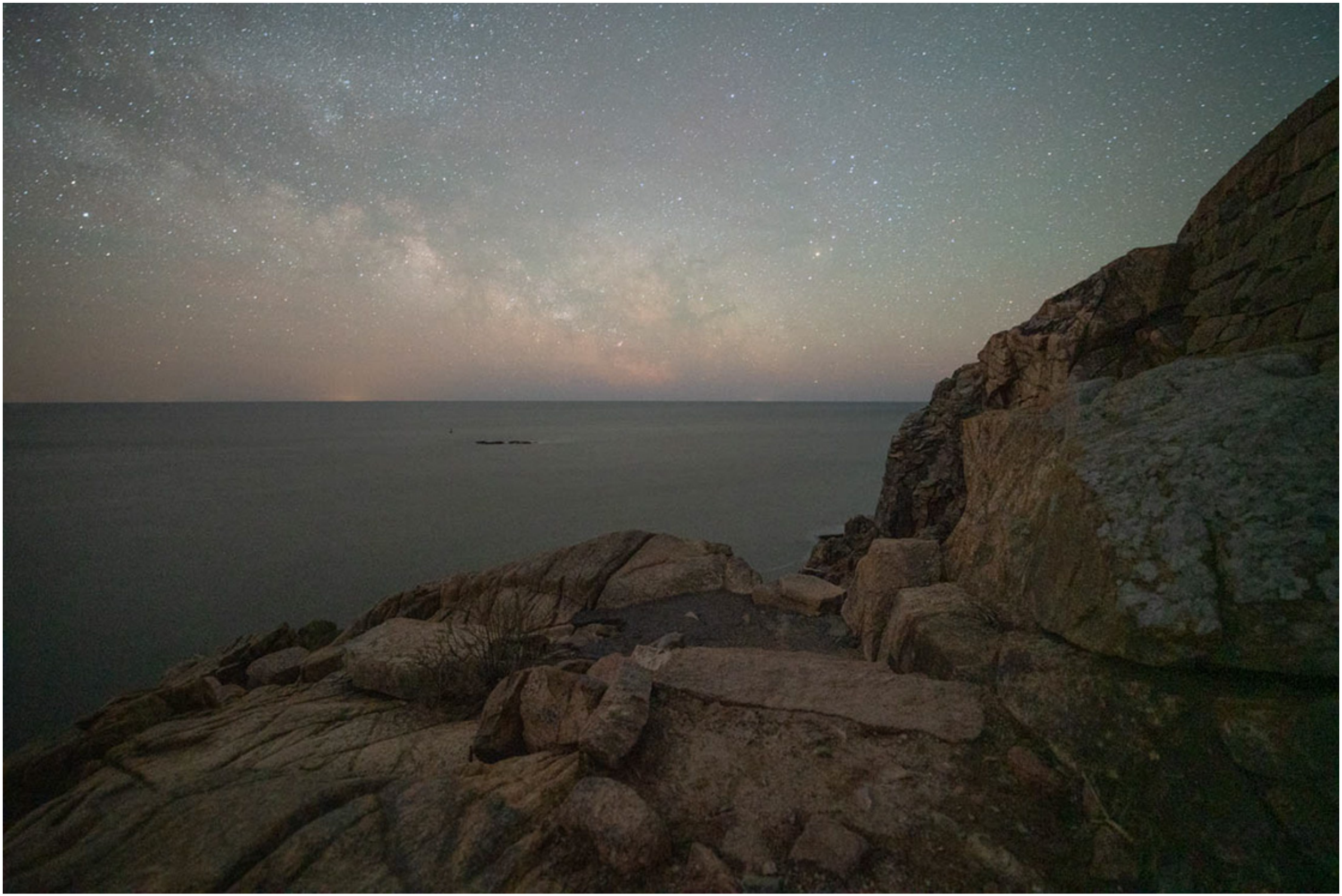

15 sec. exposure for stars


15 sec. exposure for stars
Stars look good, but foreground is noisy


30 sec. (or longer) exposure for foreground




30 sec. (or longer) exposure for foreground,
but stars are streaky



Starry Landscape Stacker

1. In Lightroom, make light exposure edits to one image, and then sync edits to others

2. Export as TIFF files*

   * You can also use RAW files, but you'll lose preminary edits

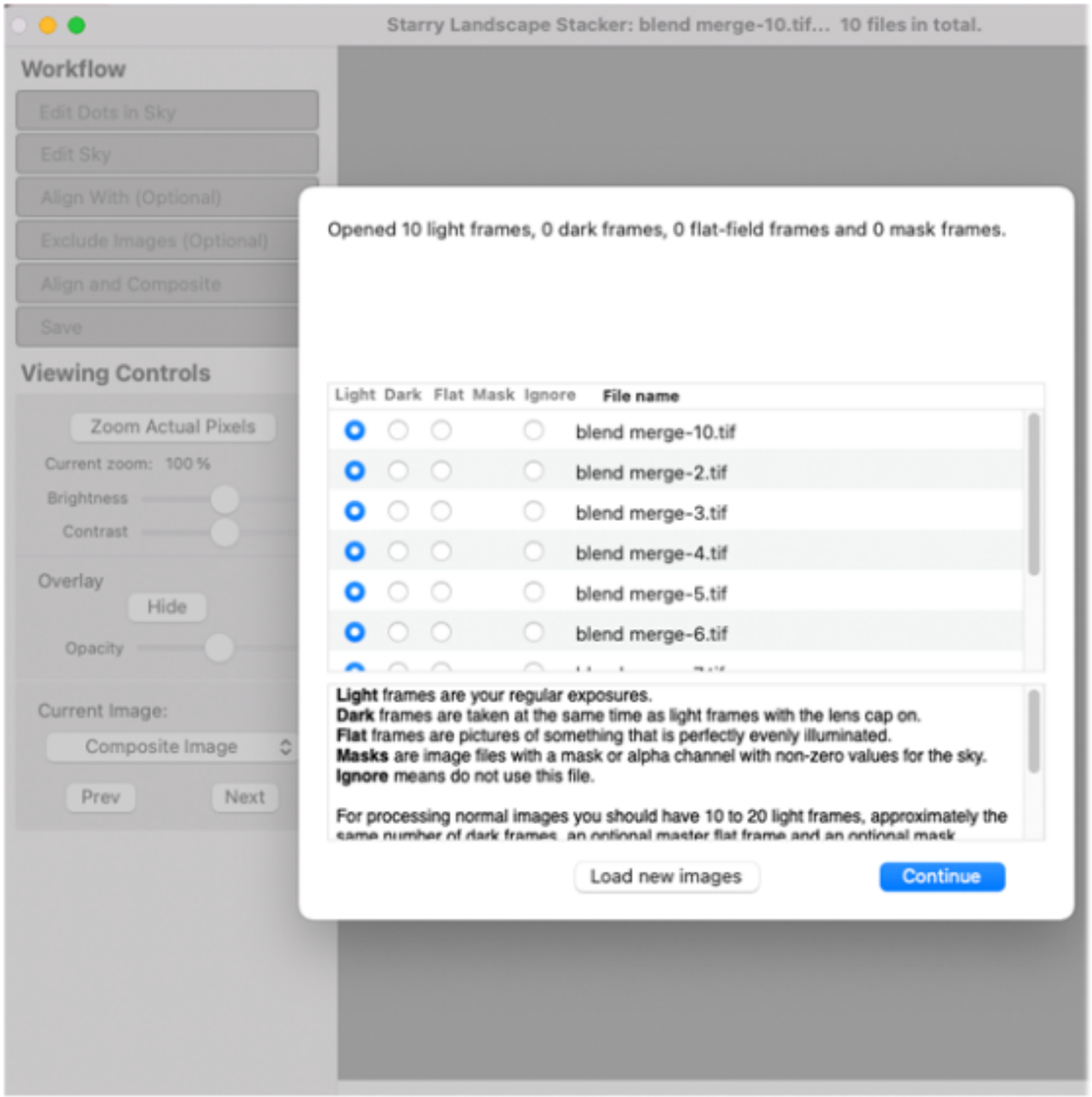
Starry Landscape Stacker

3. Open Starry Landscape Stacker

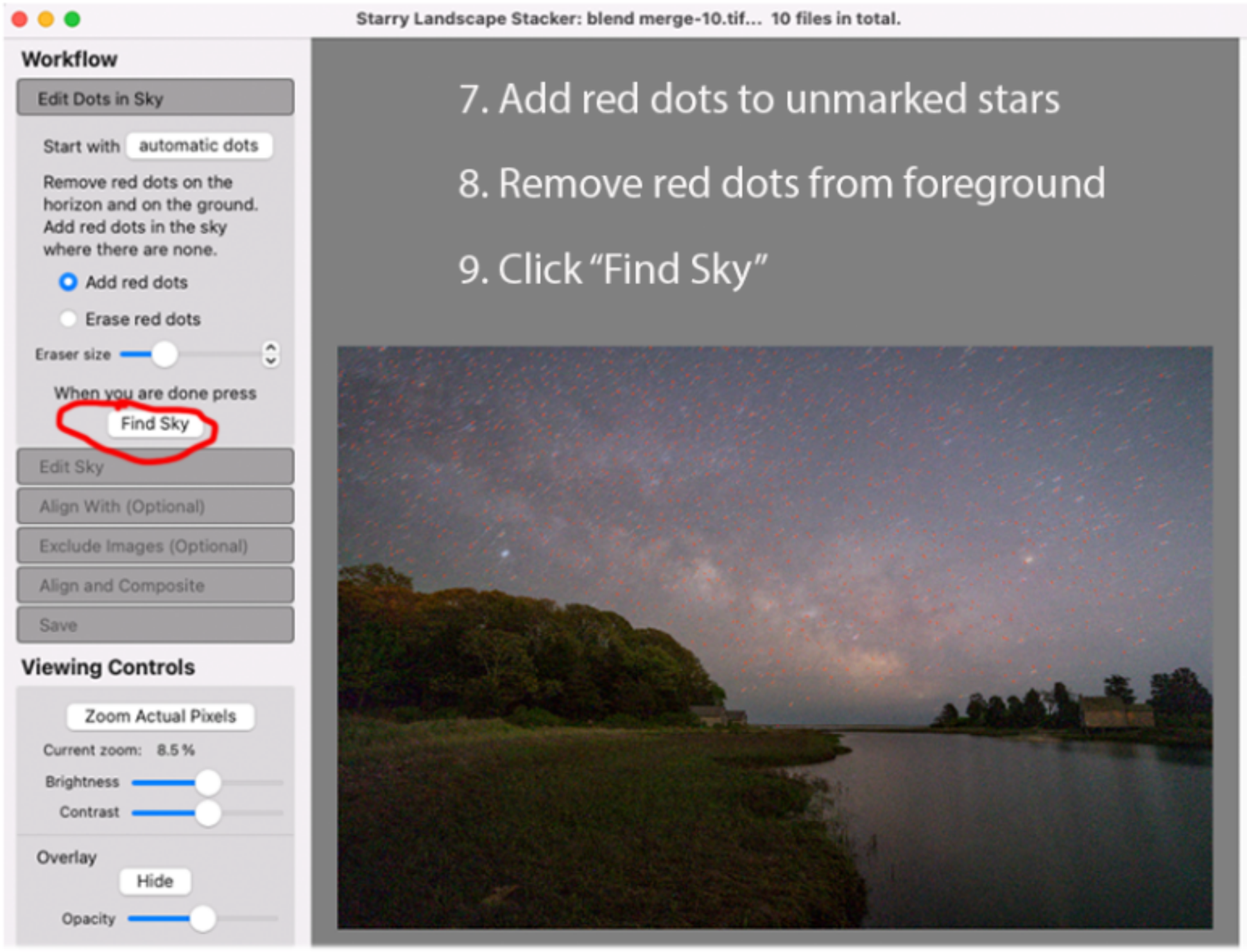
4. Go to File>Open and navigate to images and select them

5. In next screen, make sure all light frame images

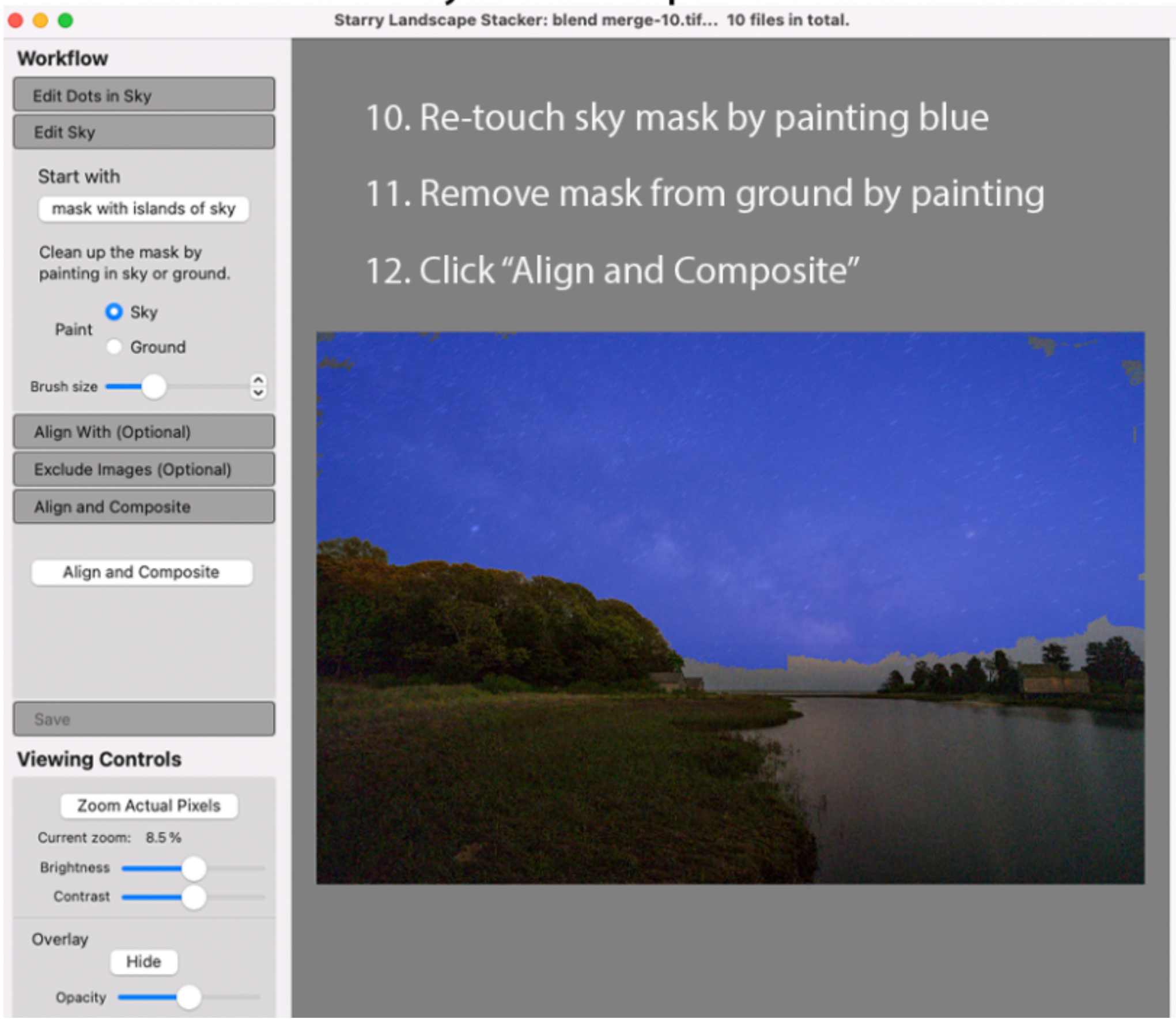
6. Hit “Continue”



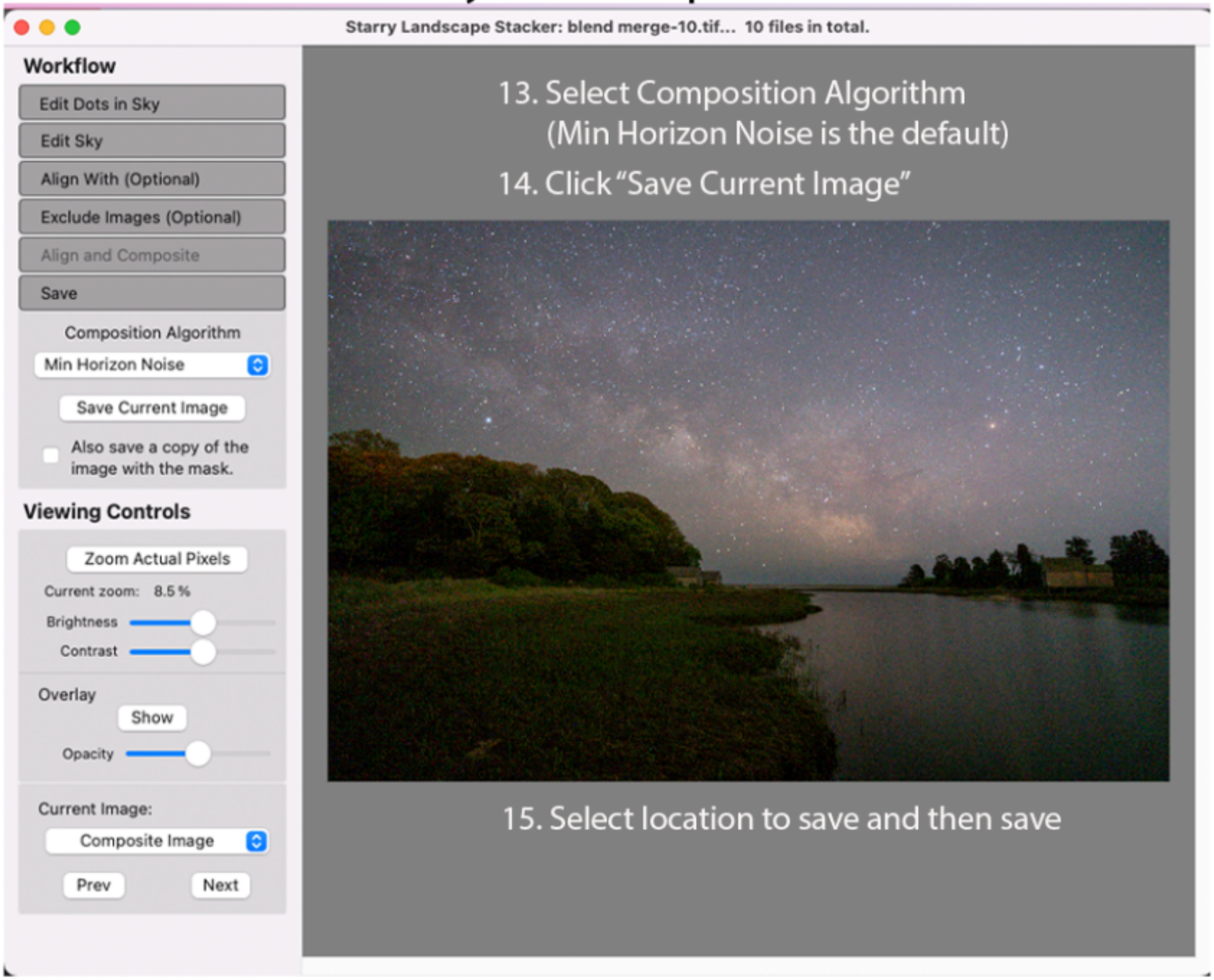
Starry Landscape Stacker



Starry Landscape Stacker



Starry Landscape Stacker



How to Focus in the Dark

FOCUSING FOR MILKY WAY

Autofocus or manual focus, depending...

Autofocus if there's enough light

Focus on a bright light at least 50 feet away

Use backbutton focusing to lock focus

Then recompose

Re-focus once in a while

Use manual focus if auto not possible

Use Live View

Find bright light at least 50* feet away or bright star. Magnify Live View to focus as best you can.

Quality of LCD screens varies,
and may never look tack sharp

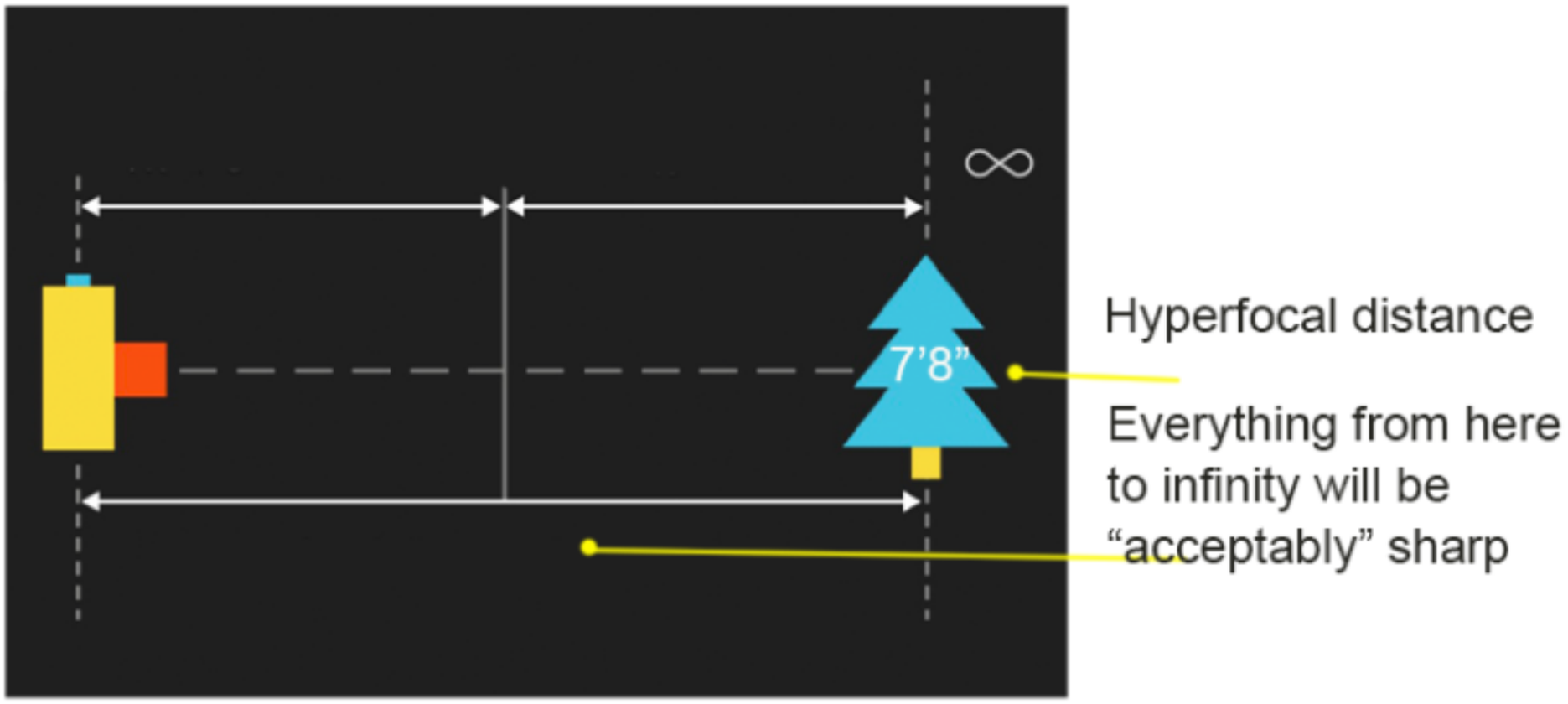
* Depending on many factores, focusing on a subject 50 feet or more away from you with full-frame camera, 16mm lens at f2.8 should - theoretically -keep everything from 7-8 feet to infinity acceptably sharp.

Using Hyperfocal Distance to Focus

Hyperfocal distance is where you focus for maximum depth of field

Everything from halfway between you and that point to infinity
should be acceptably sharp

24mp camera, 14mm lens at f2.8
Hyperfocal distance is 7’8”
Everything from halfway between you and that spot to infinity will be in focus



FOCUSING: OTHER OPTIONS

Focus on Infinity

During daytime, use autofocs to focus on infinity

Note position of focus ring when focused
on infinity (it may not be all the way over)

Mark position to use at night

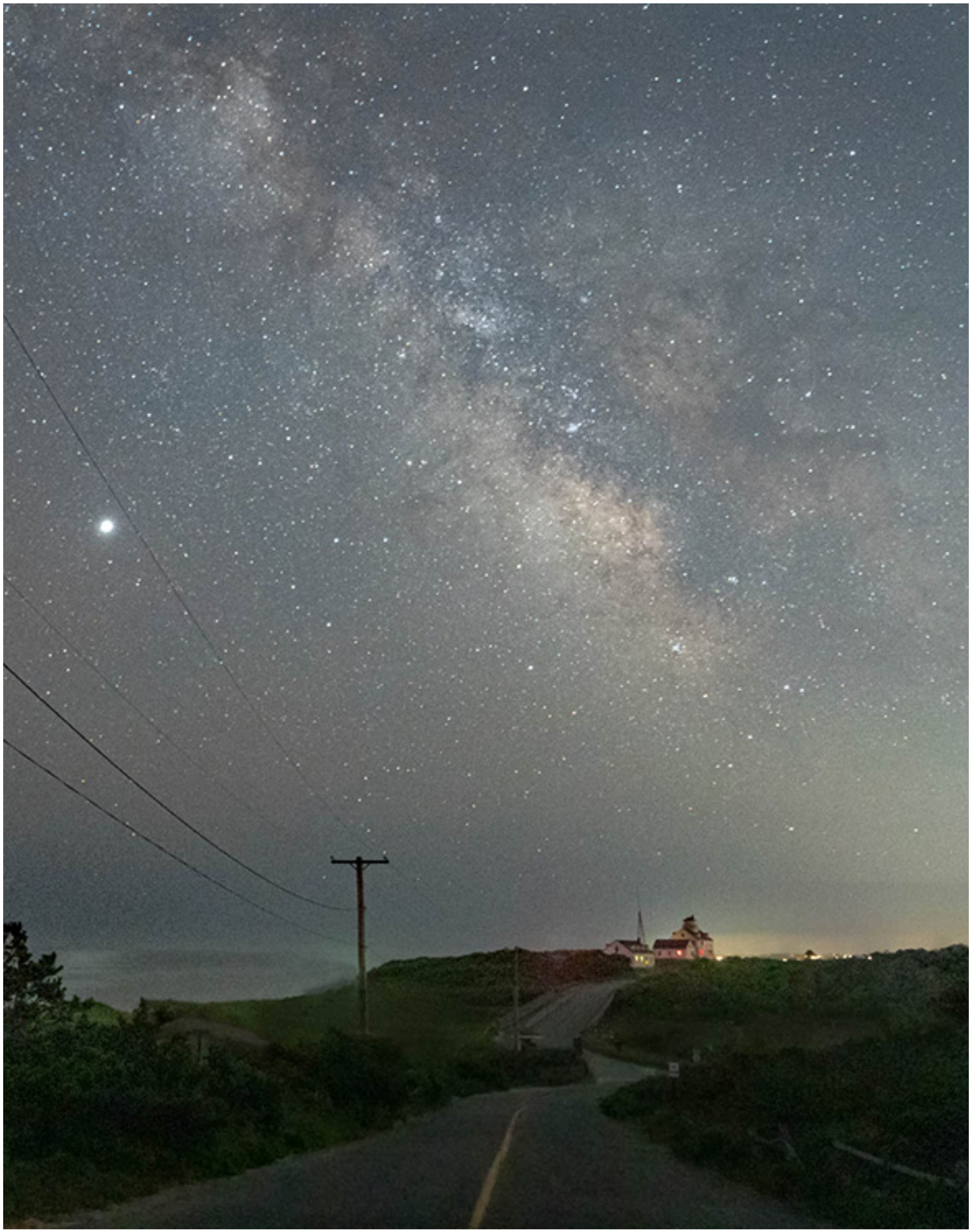
Shine a Light

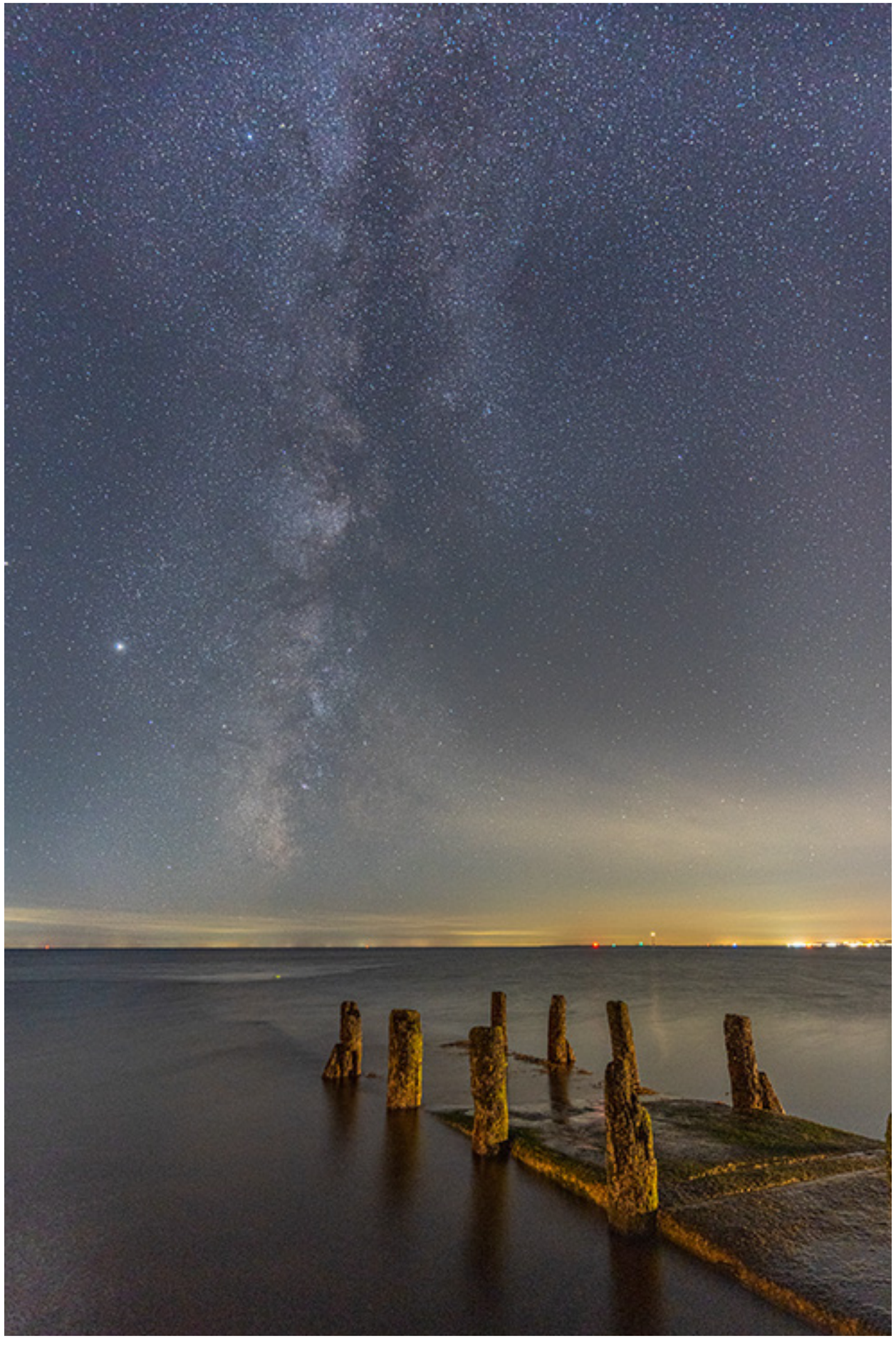
Shine bright light on object 30-50 ft. away

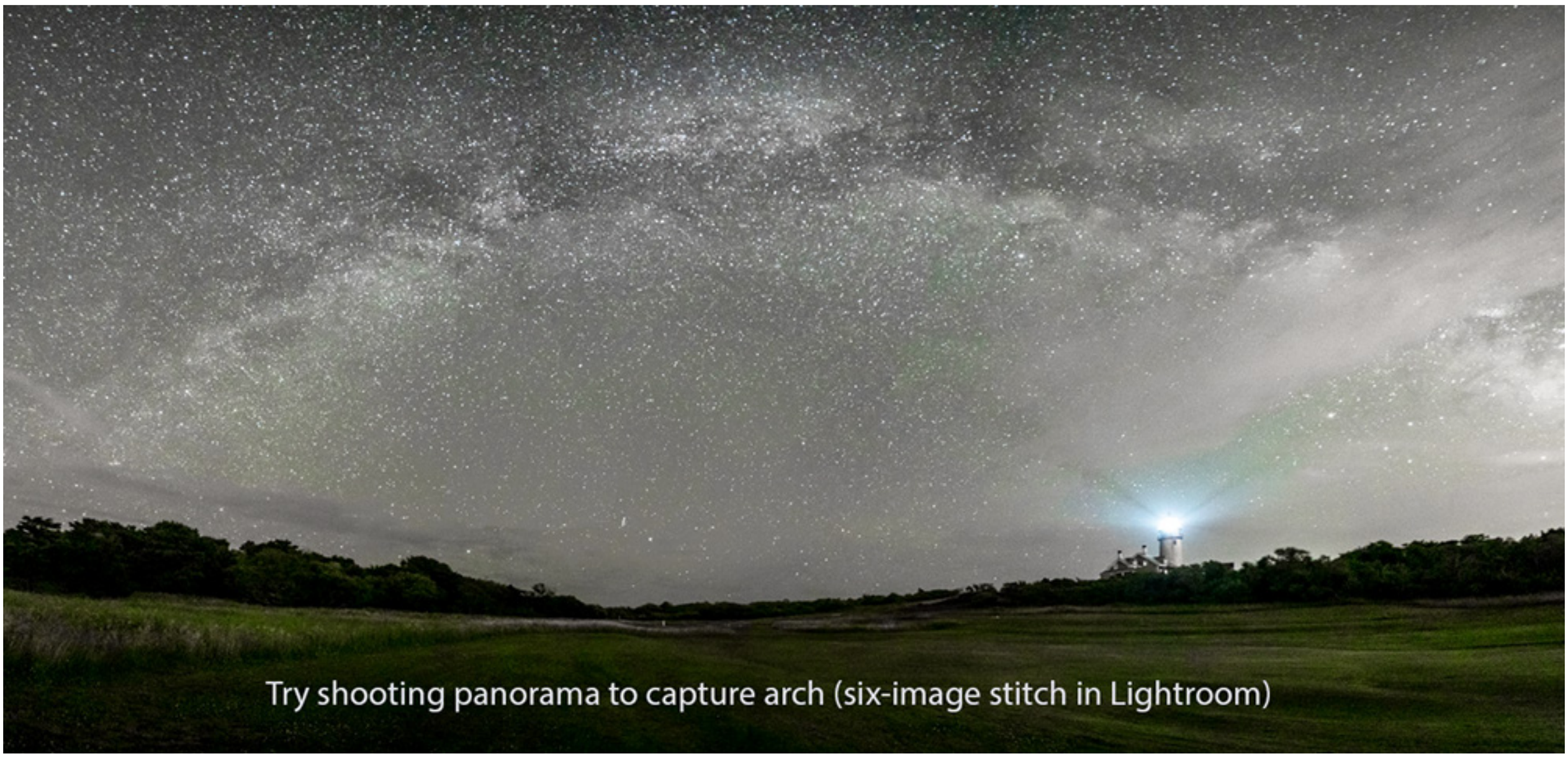
Focus on light


Picture the Picture
(it's still about composition)


Framing







Try shooting panorama to capture arch (six-image stitch in Lightroom)

Light Painting

A little light can go a long way

Try illuminating foreground
with just light from phone screen
or phone flashlight

Use edge of light circle from flashlight
instead of center

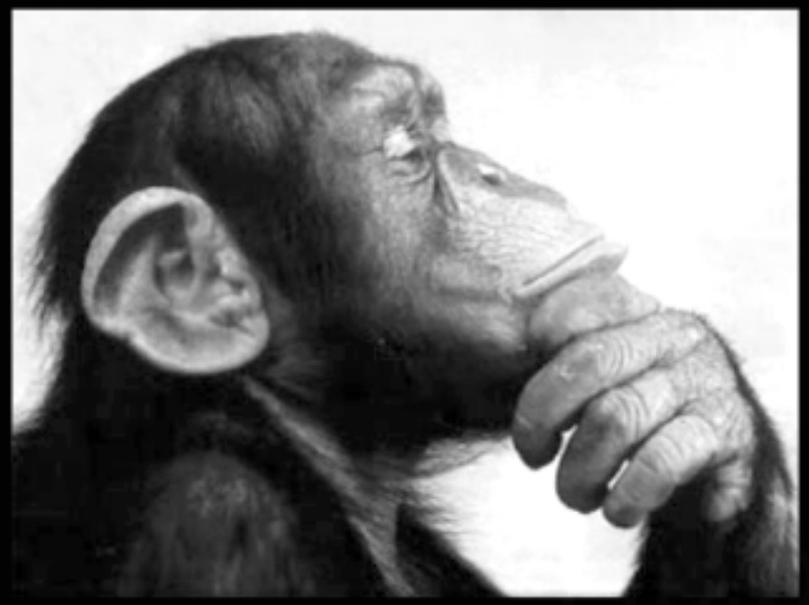
Use dimmable light

Left: Boat illumnated by short “burst”
of light from flashlight to “freeze”
motion of boat floatingi in water
during 20 sec. exposure.

Five-image panorama stitch

Planning

Pre-visualization starts at home



Plan Your Shoot

Visit during daytime (if possible)
to scope out compositions

Check celestial events
- Moon phase and rise and set time
- Milky Way rise and set time
- Meteor showers
- Planets

Weather & Tides

Weather Apps

Dark Sky (iOS)
Weather & Radar
Willy Weather
Clear Outside
AccuWeather

Tides and Waves

MagicSeaweed (ocean tides, waves)
Tides Near Me

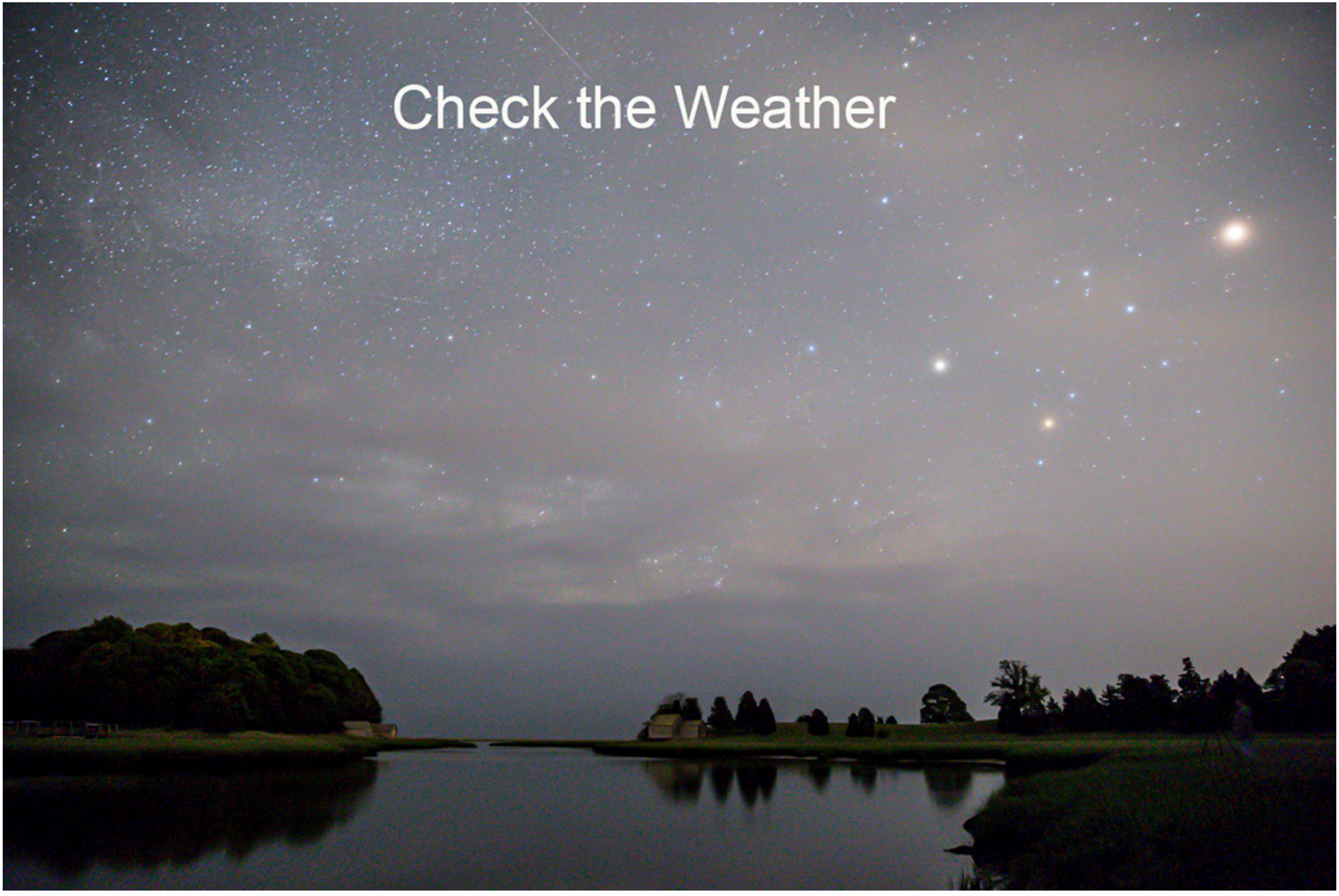
Sun, Moon, Stars, Etc.

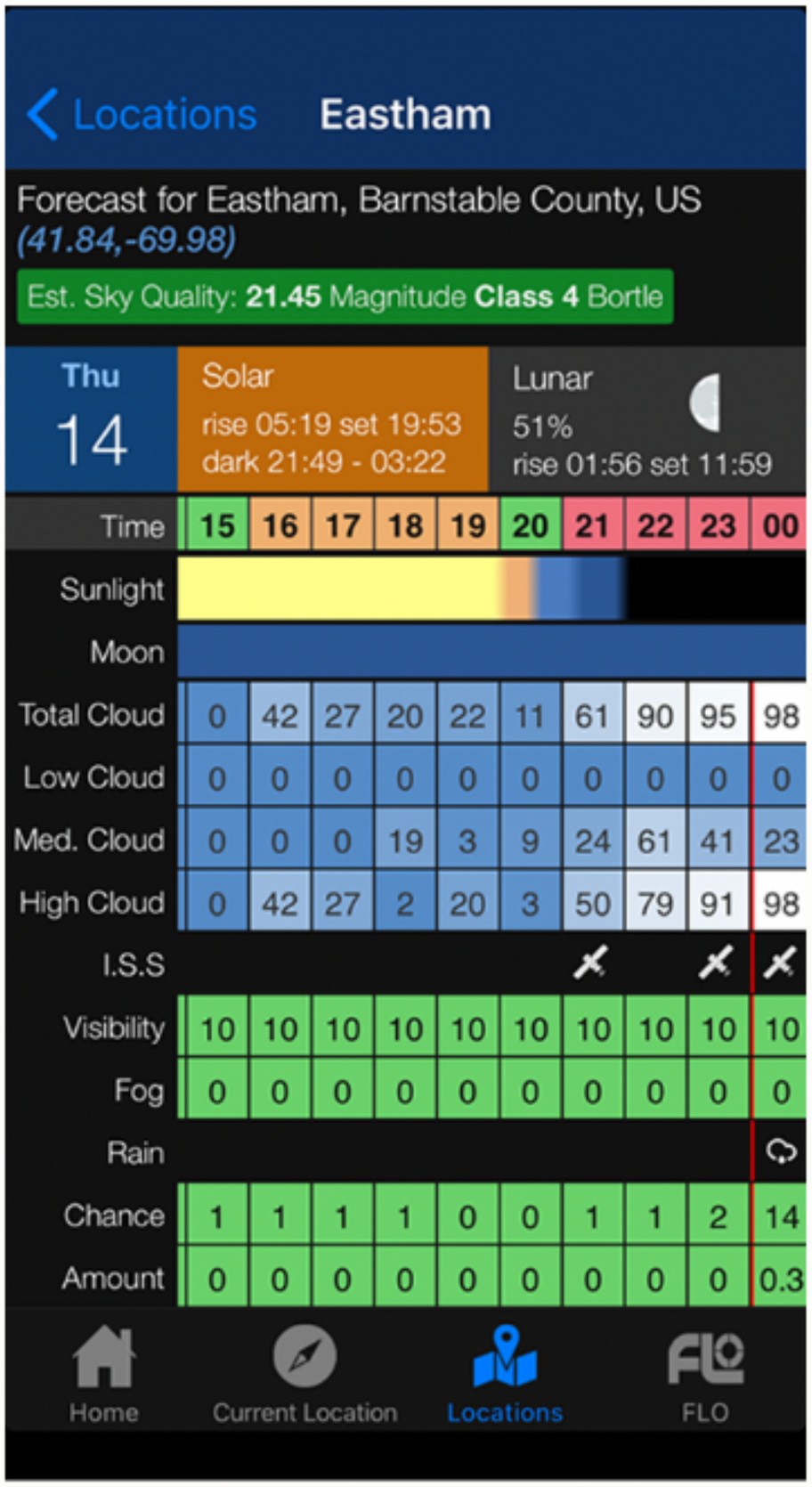
PhotoPills

Astro

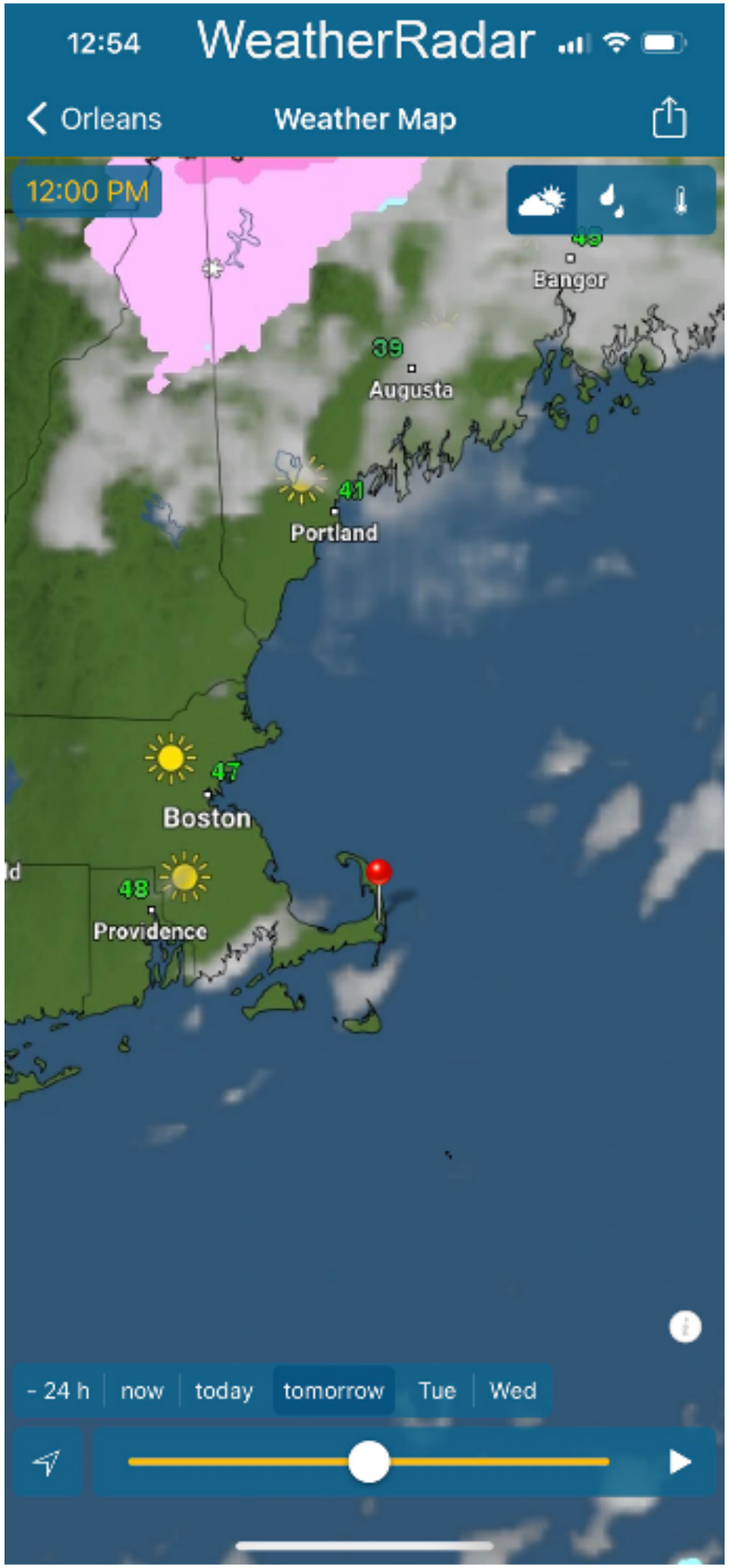
GoSkyWatch

Check the Weather

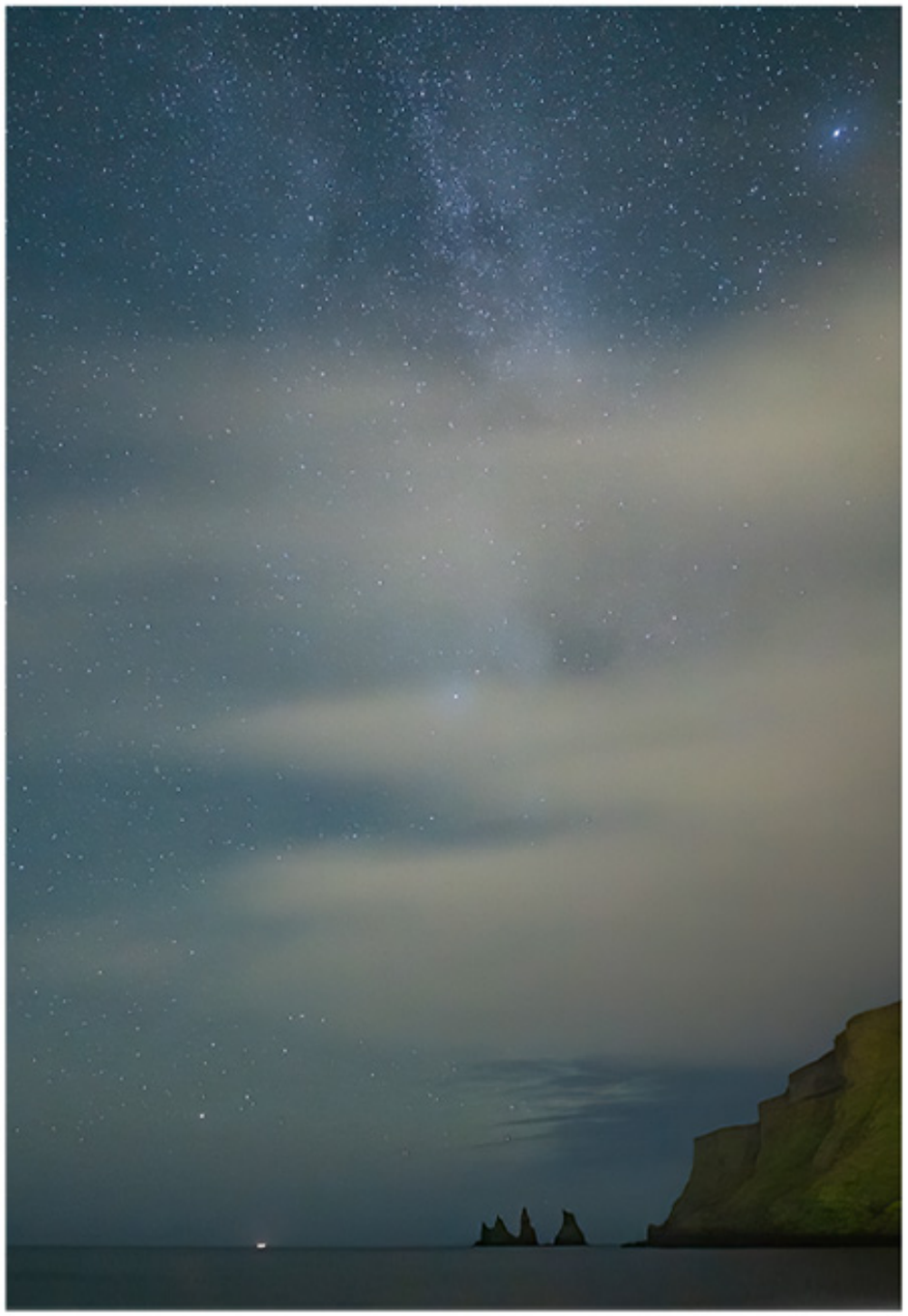




Clear Outside


12:54
WeatherRadar
Orleans
Weather Map
12:00 PM
43
Bangor
39
Augusta
41
Portland
47
Boston
48
Providence
- 24 h
now
today
tomorrow
Tue
Wed


You can’t always get what you want...

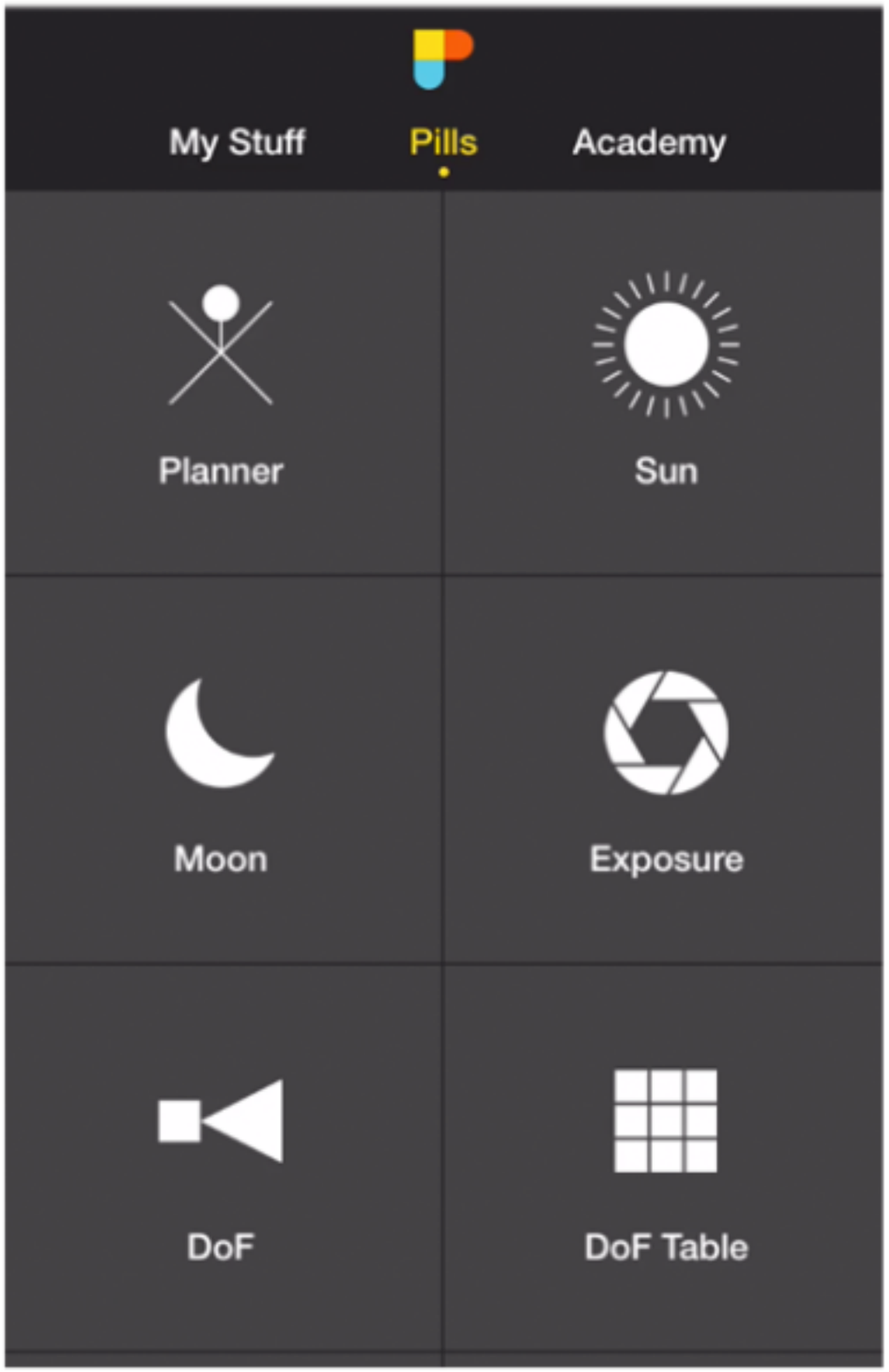


Lemonade out of lemons?

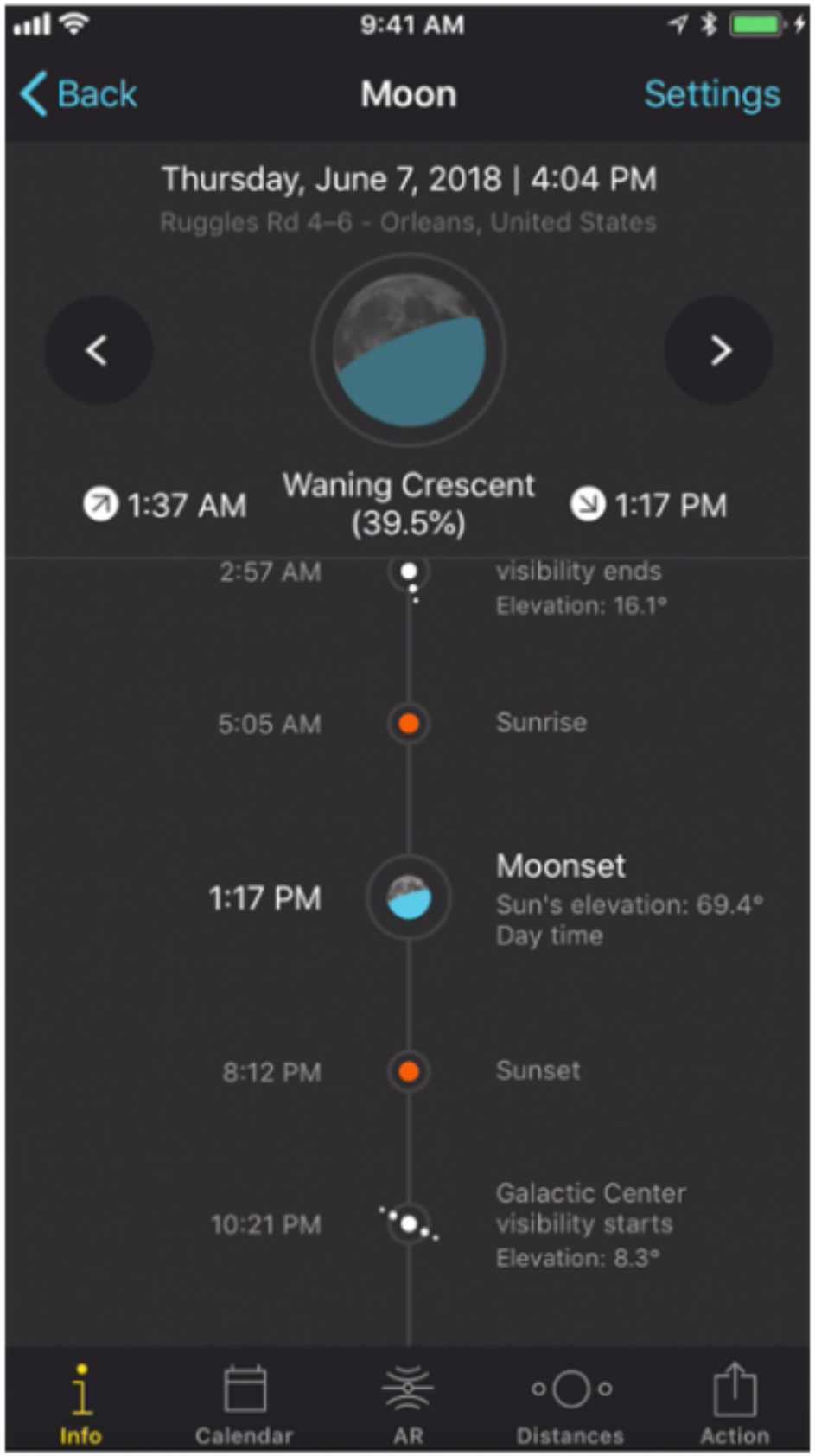
Plans don’t always work.

Embrace serendipity.

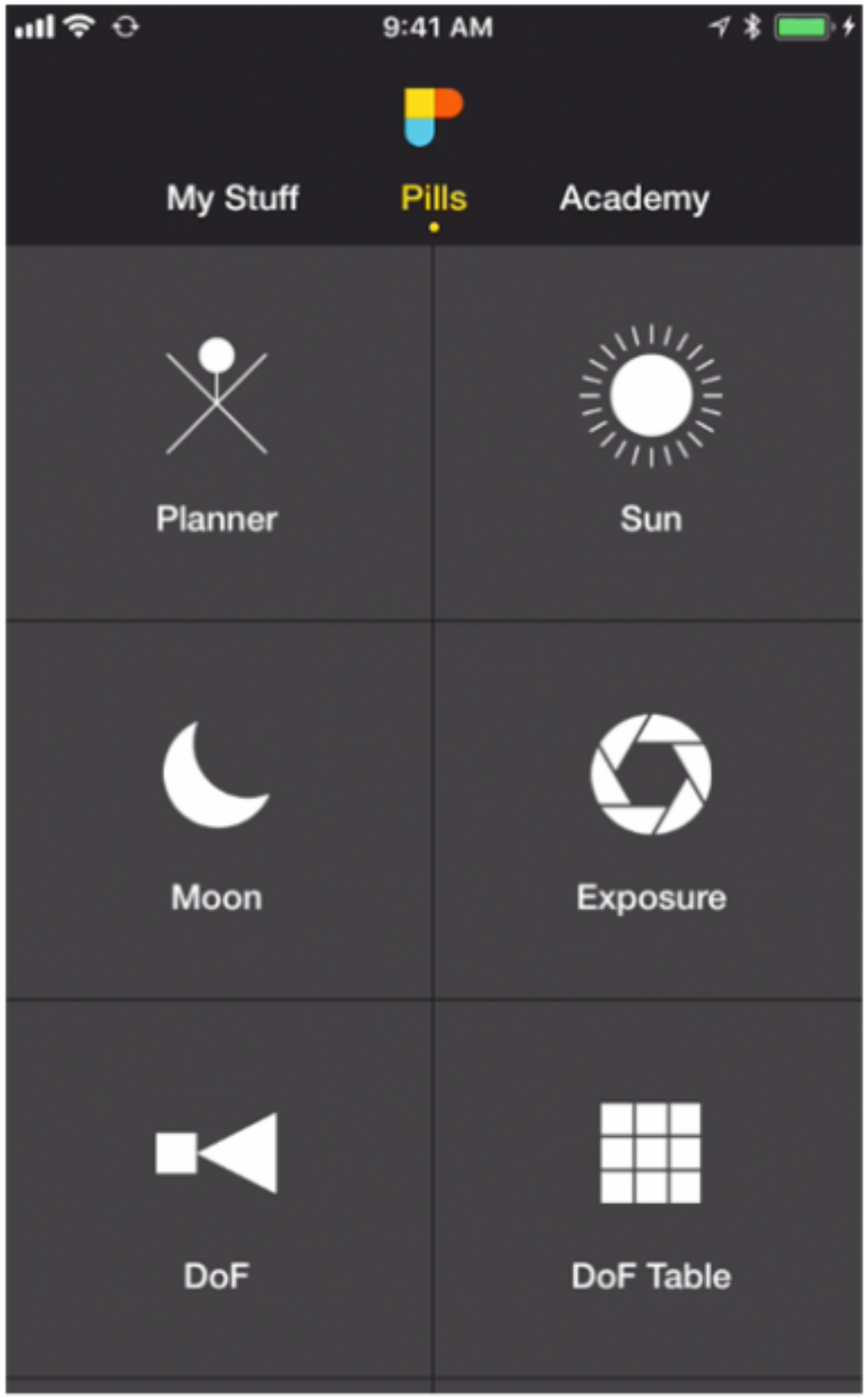
Learn to improvise.


My Stuff
Pills
Academy
Planner
Sun
Moon
Exposure
DoF
DoF Table

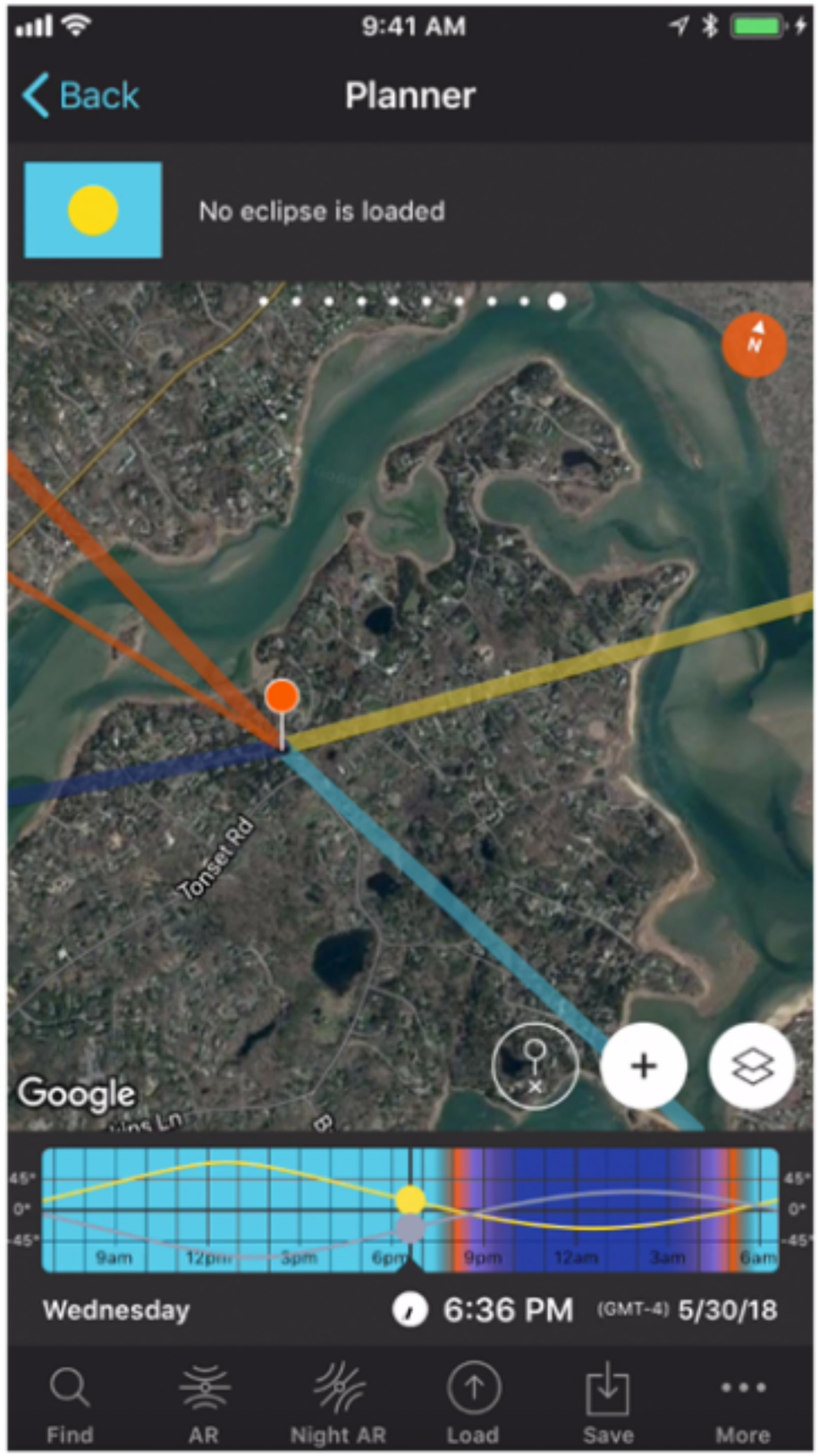
PhotoPills



PhotoPills/Moon & Milky Way Planning

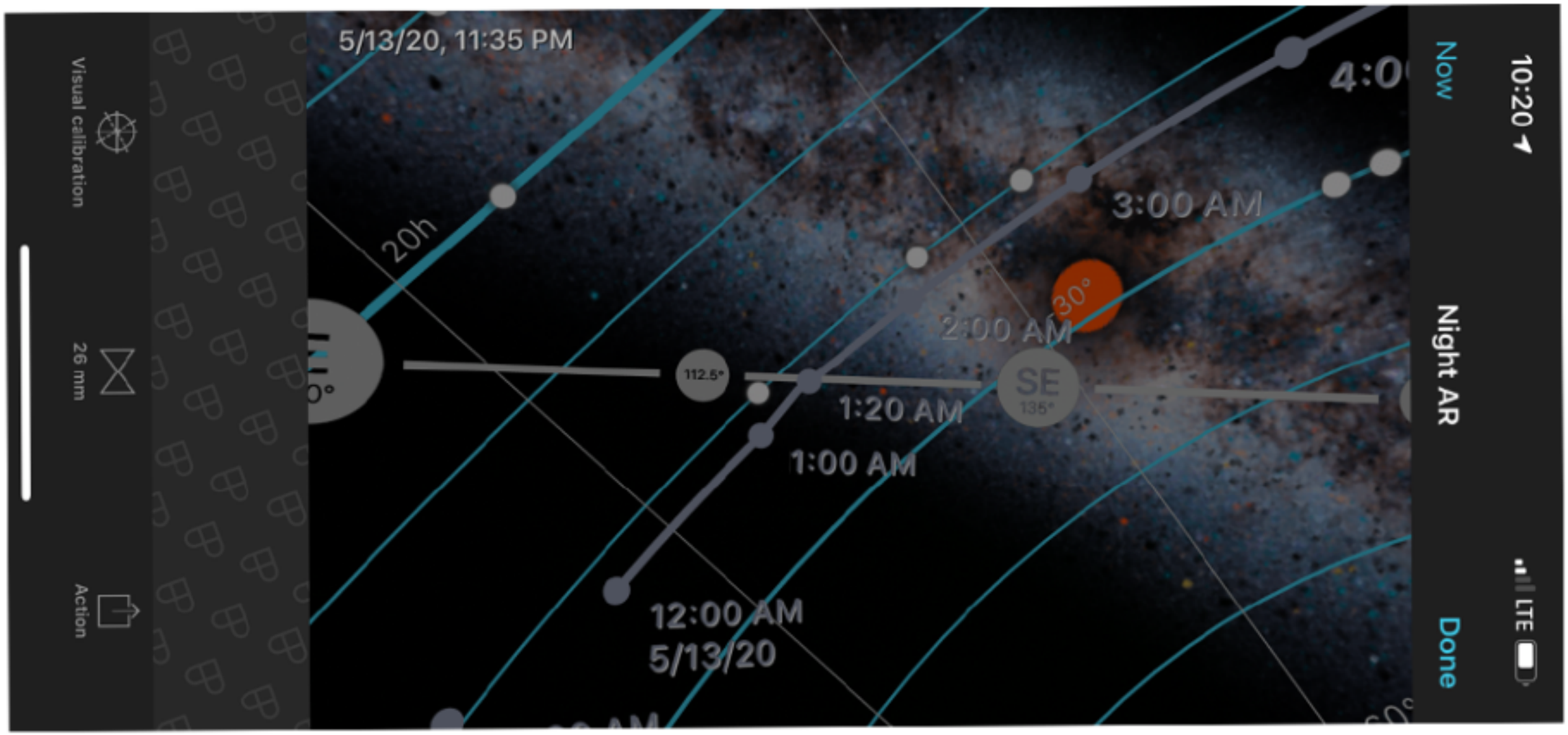

9:41 AM
My Stuff
Pills
Academy
Planner
Sun
Moon
Exposure
DoF
DoF Table

PhotoPills

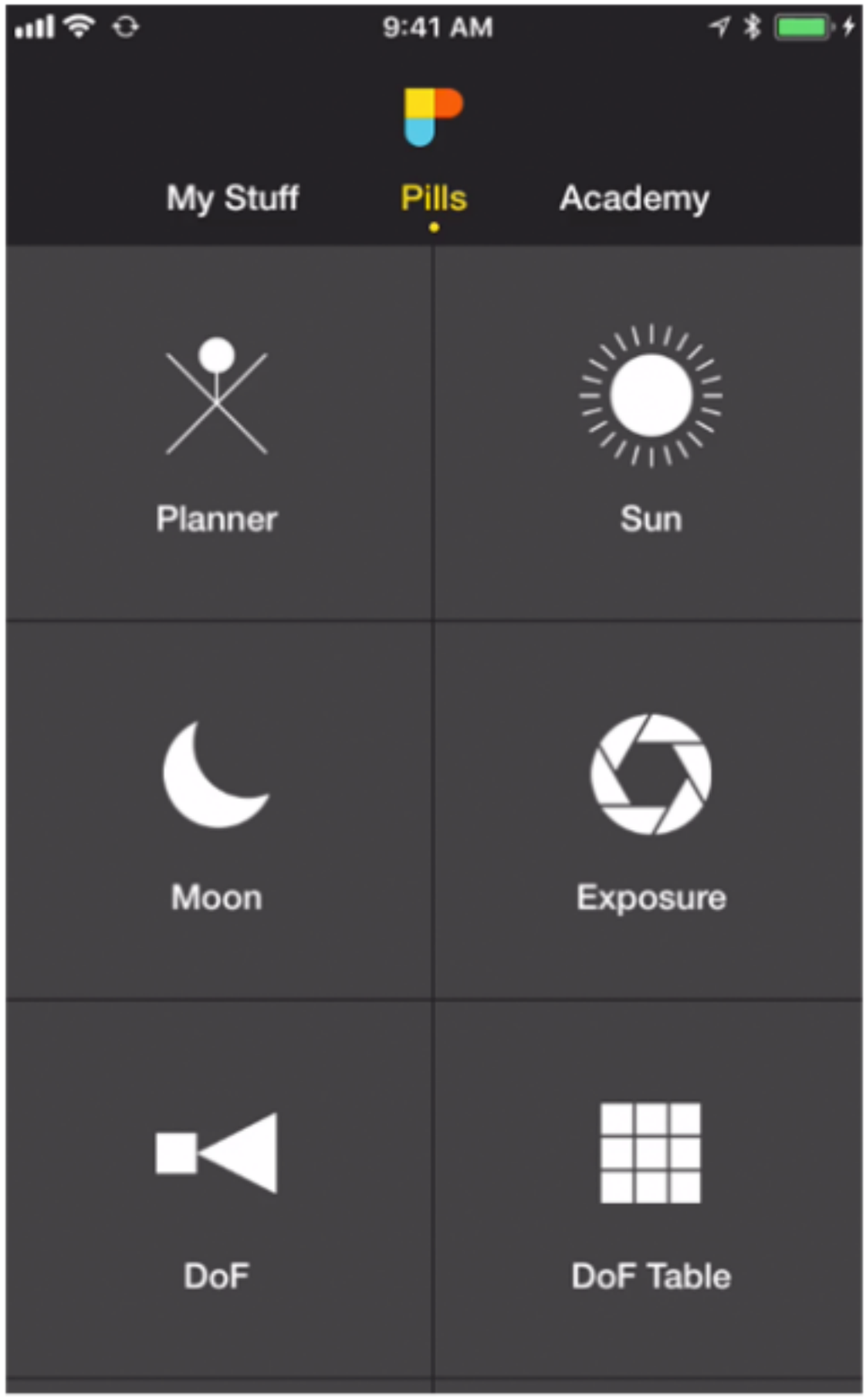


PhotoPills Planner/Map, track sunrise/moonrise & set

Project outline of Milky Way



Night AR (Augmented reality)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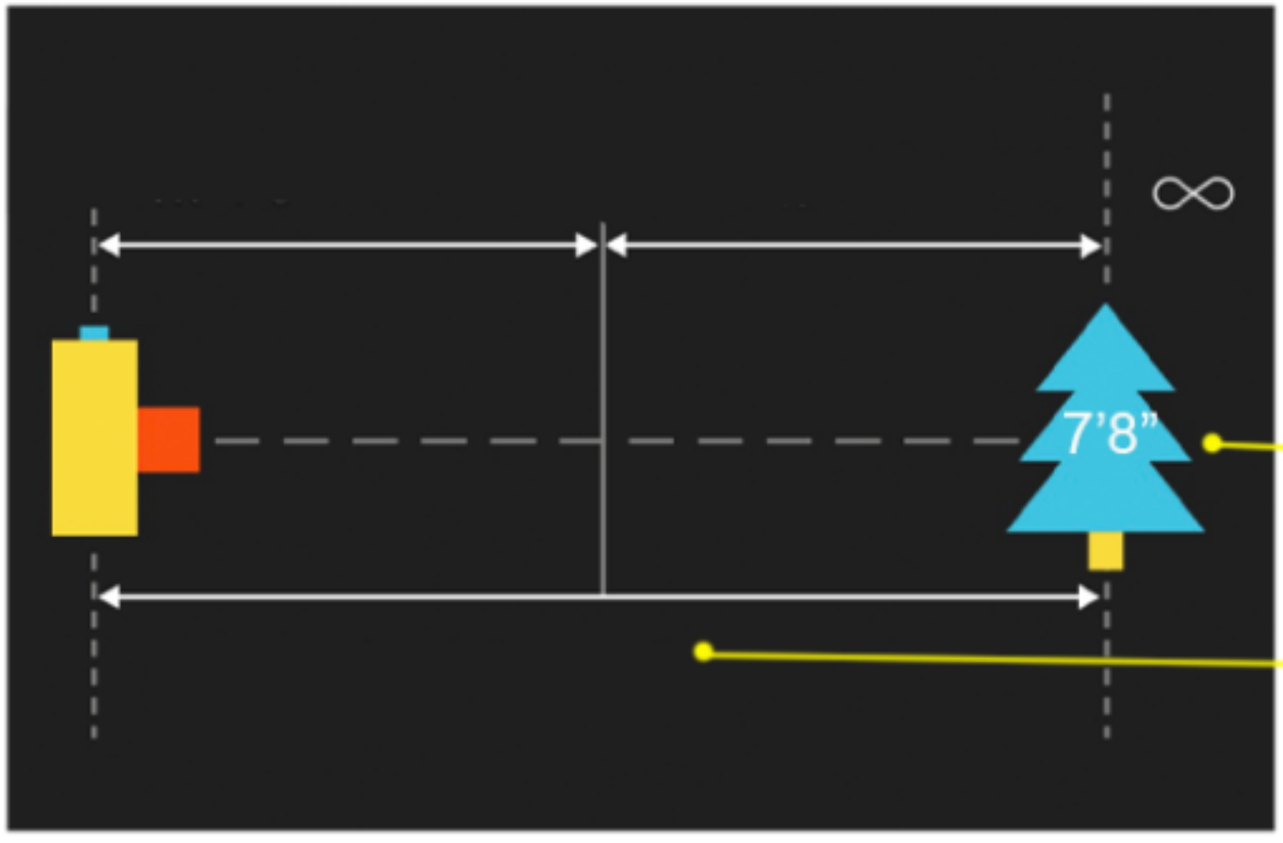
DoF Table

PhotoPills

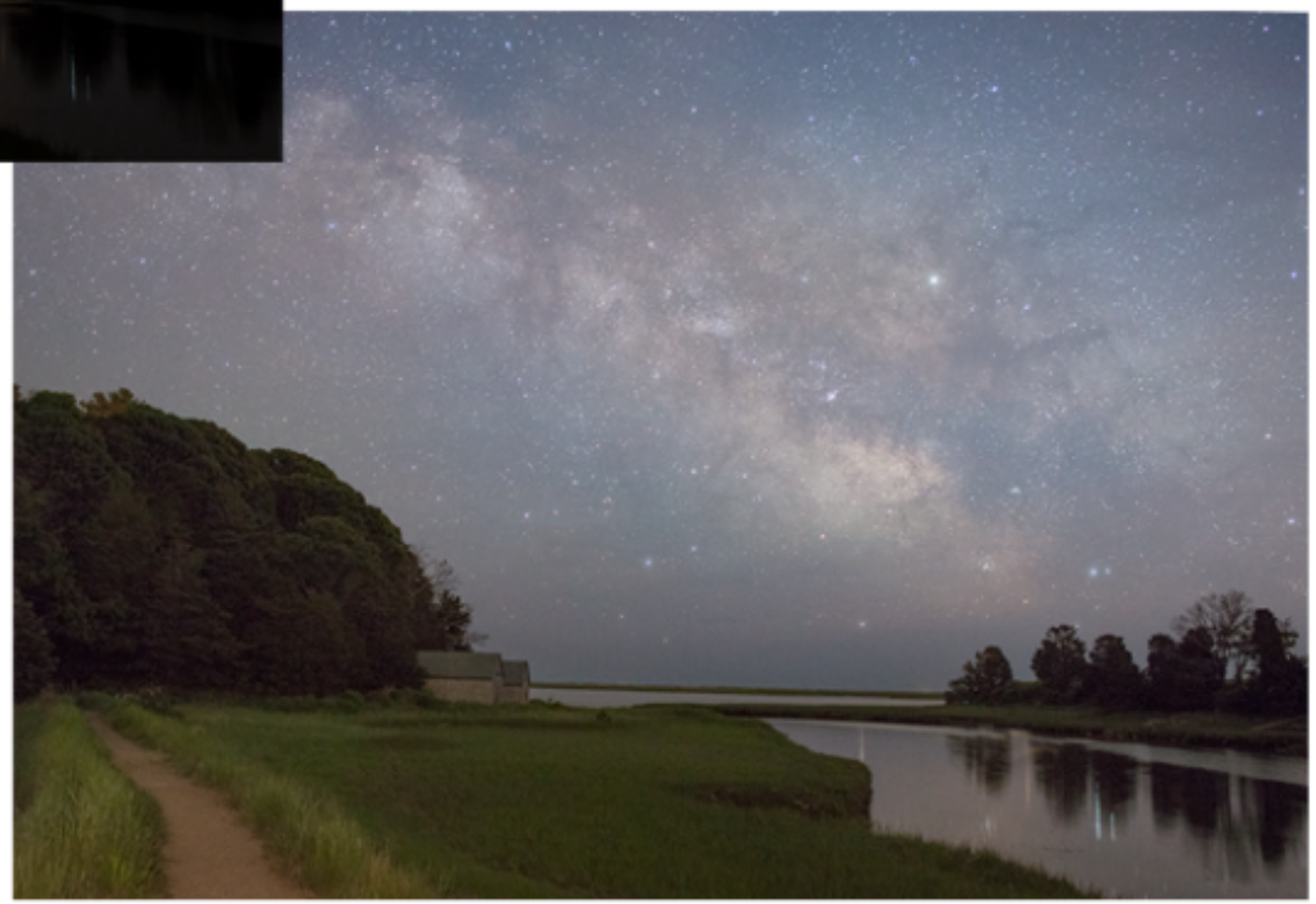
Use Photopills to calculate hyperfocal distance



How to Process Milky Way Photographs

Before

ISO 1250
F1.8
20 secs.



After

Lightroom/Adobe Camera Raw Workflow

Global Adjustments

- Over brighten image with Exposure slider to check quality
- Return Exposure to neutral and then increase as needed
- Adjust White Balance (temp slider in the 3200-4200 +/- range)
- Brighten Shadows as much as needed (often go 50-100 to start)
- Increase Whites and Clarity to taste
- Increase Dehaze (maybe reduce Saturation afterward)
- Increase Noise Reduction as needed
  (+10 Luminance, +25 Color to start)

Lightroom/Adobe Camera Raw Workflow

Local Adjustments

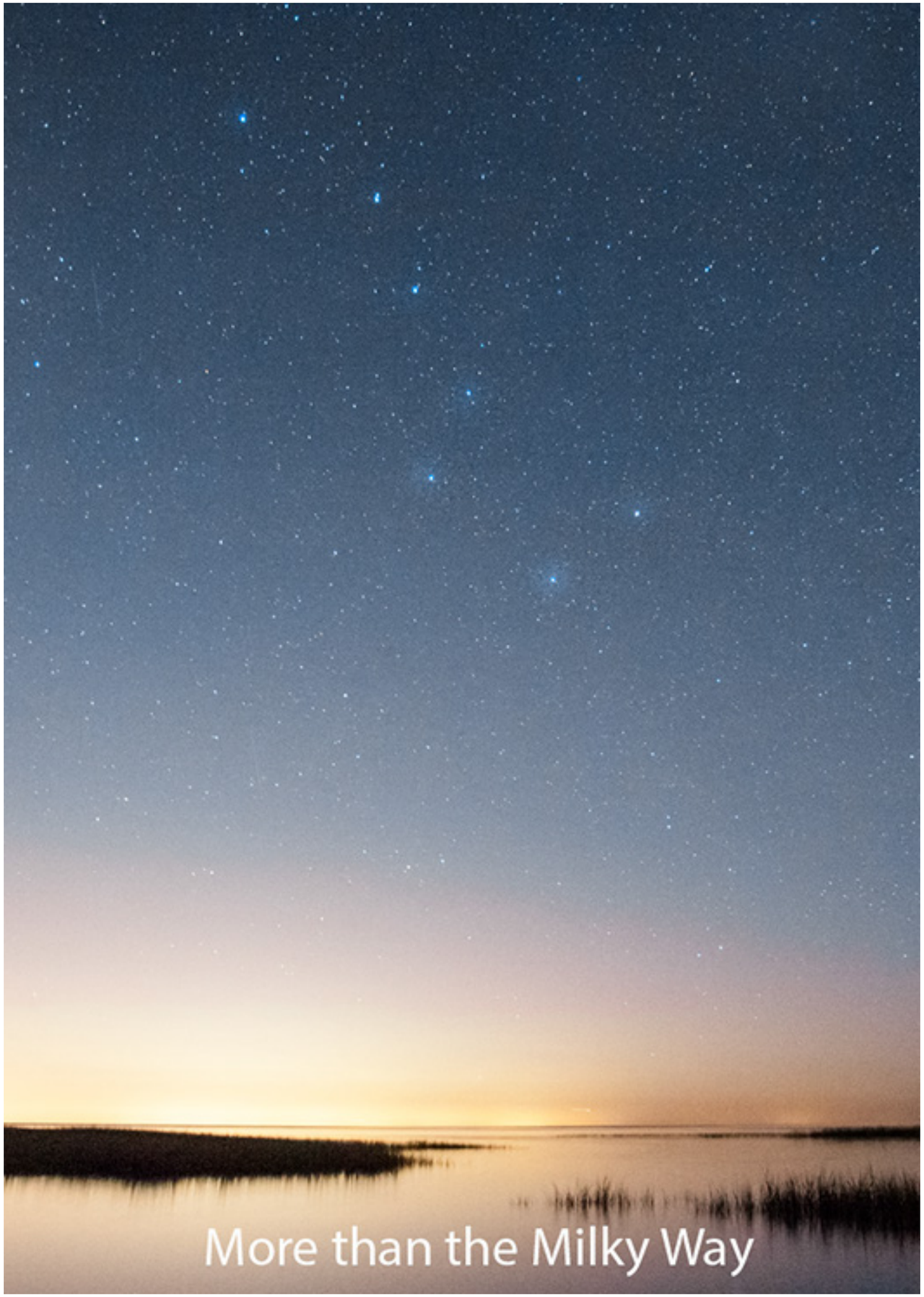
Make the stars pop
- Select Adjustment Brush or Graduated Fillter
- "Paint" sky
- Adjust Whites, Clarity, Dehaze and Texture to taste

Use Adjustment Brush and other tools to make local adjustments to exposure, color and noise.

Lightroom/Adobe Camera Raw Workflow

Refinement Options

- Darken Blacks globally or locally to add contrast, reduce noise
- Use Adjustment Brush for local noise reduction
- Add a new Adjustment Brush to sky and increase Clarity
- Add a new Adjustment Brush to sky and Dehaze
- Transfer to Photoshop for re-touching


More than the Milky Way

Star Trails

30 30-sec. exposures, f2.8, ISO 100, 16mm

18 one-minute exposures (14mm lens, F5, ISO 800)

How to Create Star Trails with Multiple Images

Take multiple short exposures
(do test for optimal exposure)

Use intervelometer to program
number of shots, or shoot manually

From Lightroom or Bridge, load images
into Photoshop as layers in single image

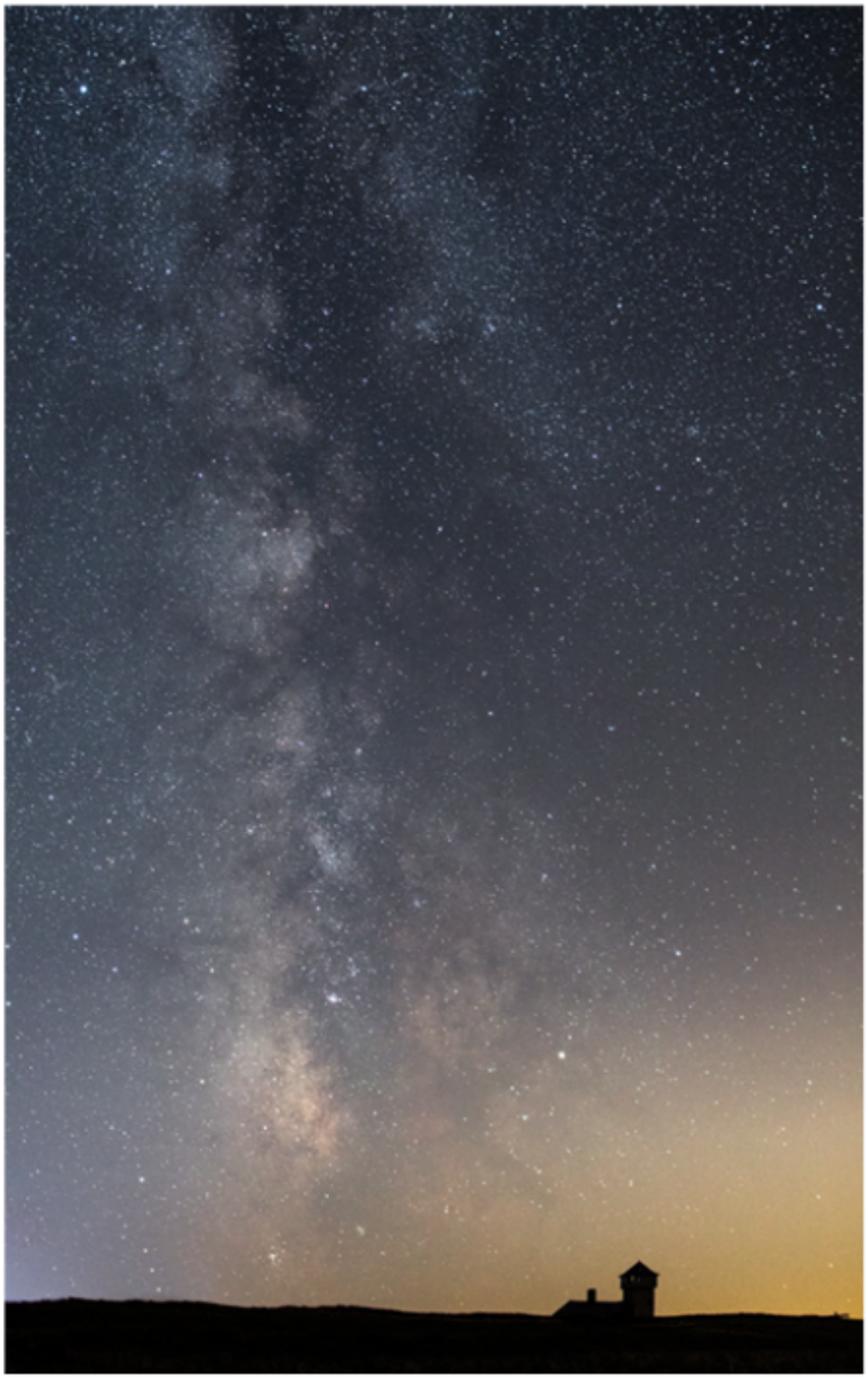
Select all but bottom layer

Change blend mode to lighten

Flatten image (depending on file size)
or create composite layer
(PC - CMD + ALT + SHFT + E)
(MAC - CTRL + OPT + SHFT + E)

Edit as needed


Comet Neowise



ISO 1250, f2.8, 20 secs., 14mm

Summary

May - October
- Summer is prime

Look east to south

Get away from light
- let eyes adjust

Moonless nights
- New moon
- Check moonrise and moonset times

Helpful Apps
- PhotoPills
- Sky Safari
- GoSkyWatch
- Weather: Accuweather, Dark Sky,
- Clear Outside

Summary

Settings:

Raw

Manual exposure

Turn off Long Exposure

Noise Reduction

ISO 2000 (+/-)

F2.8 (+/-)

15-20 secs. (+/-)

Manual Focus

Hyperfocal distance

Shoot for exposure blends

Plan: Photopills

Tonight

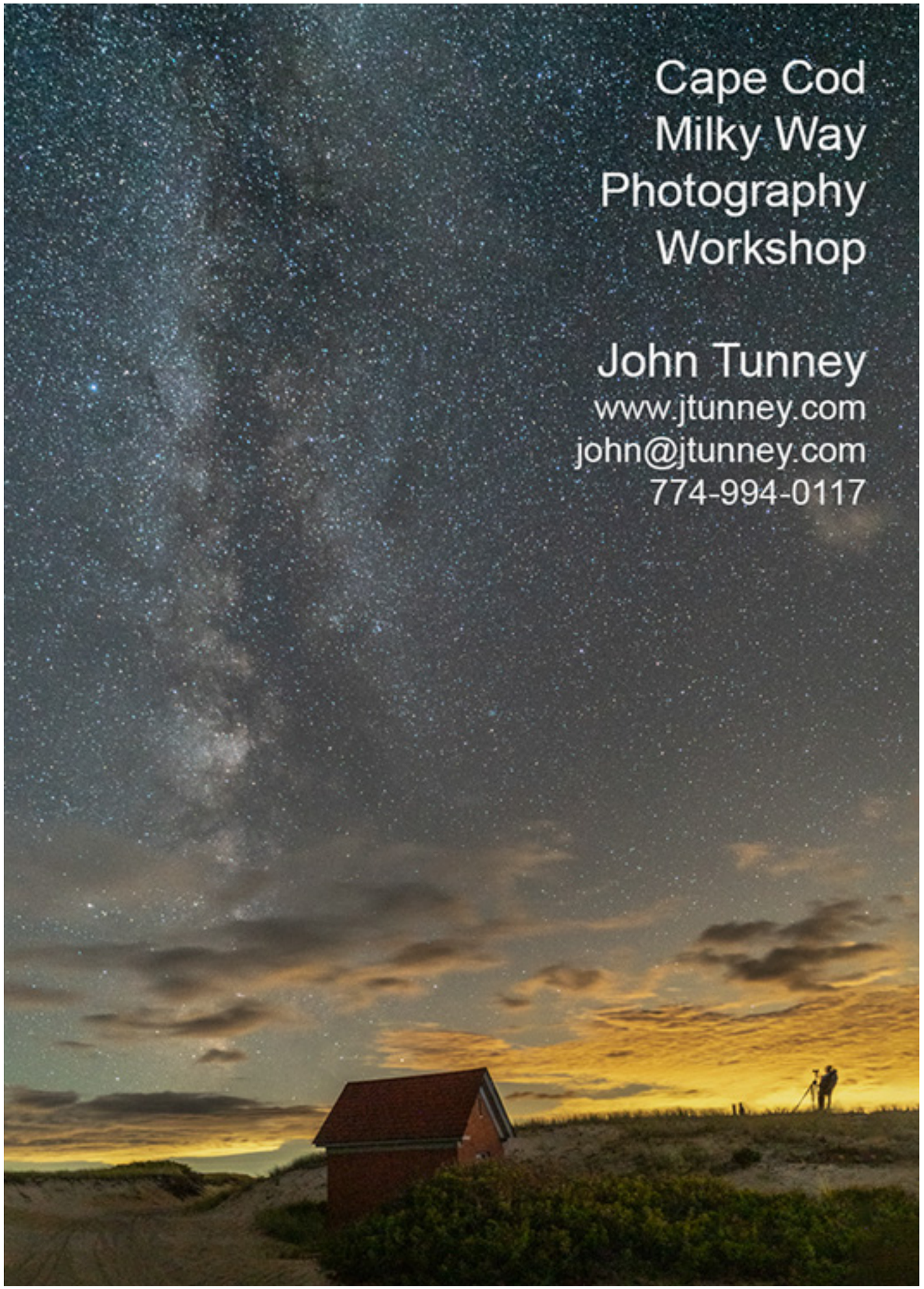
At least once:
- Take 10-20 consecutive shots for stacking.
- Take two shots for sky replacement
  (one standard, one extra long exposure).

- Multiple shots for a panorama stitch.

- Test ISO invariance.
  Take the same image at different ISOs (1600-6400)

Watch your flashlight.

Enjoy the experience.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