Orange County Astronomers
AstroImaging SIG
13 Oct. 2015

Planning for the 2017 Total Solar Eclipse

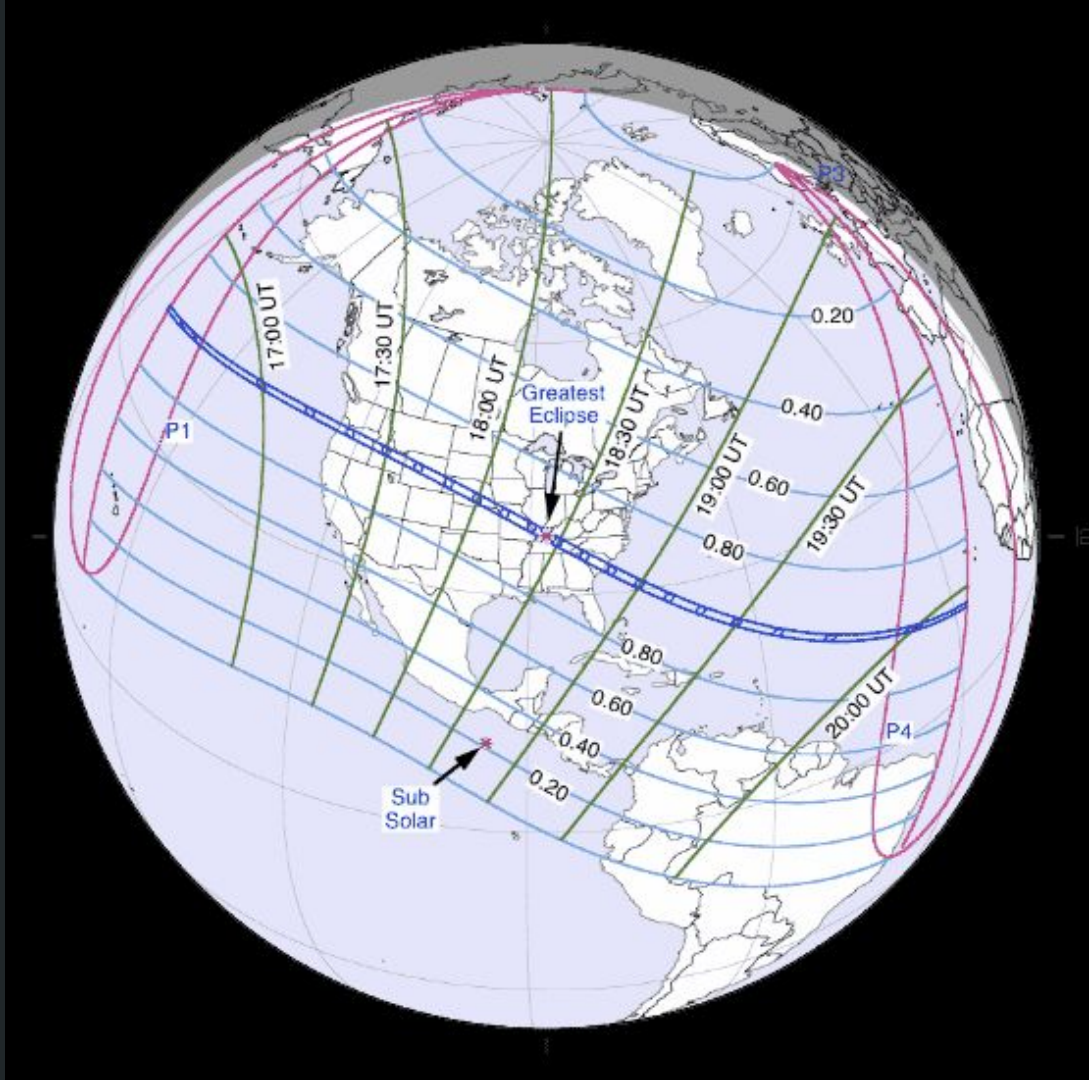
This talk is about planning for the 2017 Total Solar Eclipse.

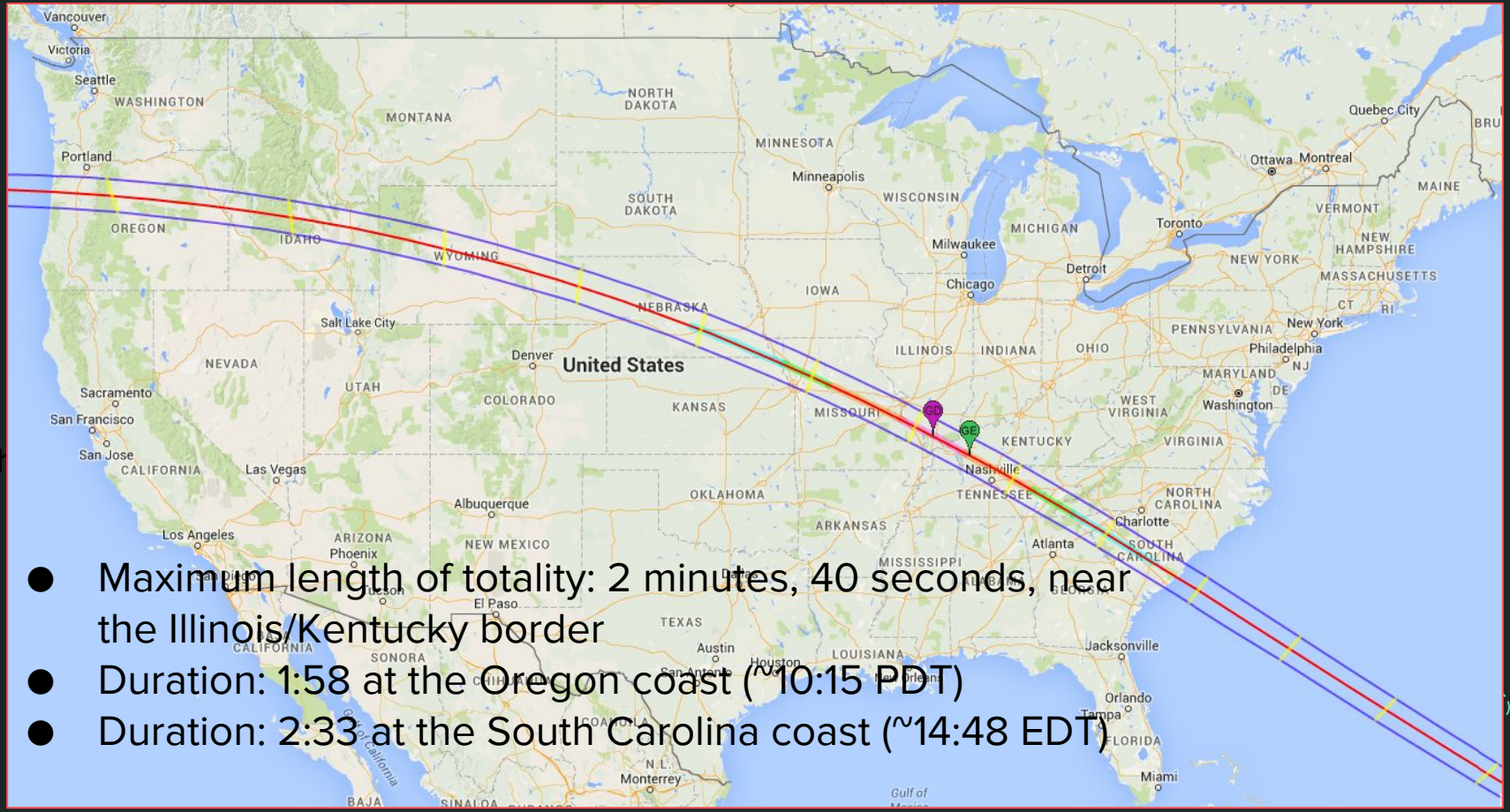
This talk is not about THE plan or even MY plan for the eclipse. It's about what you should consider for YOUR plan for the eclipse.

This talk is also about my August 2015 eclipse recon (reconnaissance) trip covering the eclipse track from eastern Idaho to central Nebraska.

2017 Eclipse General Information

- 21 Aug. 2017 (Monday)
- All of the U.S. will see at least a partial eclipse
- Width of totality path: ~70 miles
- Landfall is only in the continental U.S.
- ~80 minutes of partial phase before and after totality => ~ 3 hours for the complete show

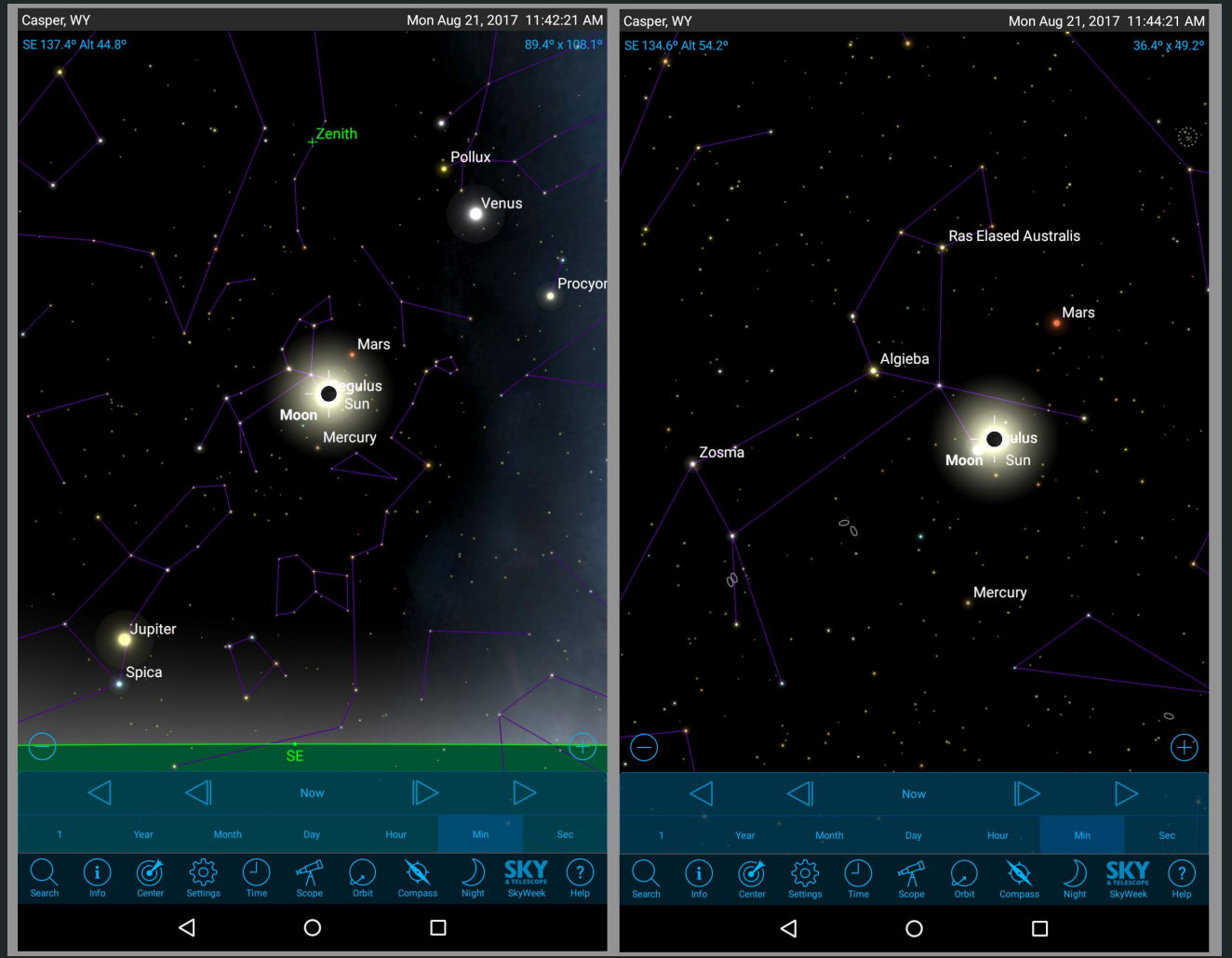




- Maximum length of totality: 2 minutes, 40 seconds, near the Illinois/Kentucky border
- Duration: 1:58 at the Oregon coast (~10:15 PDT)
- Duration: 2:33 at the South Carolina coast (~14:48 EDT)

Simulated view* from Casper, Wyoming

* Android SkySafari 4+



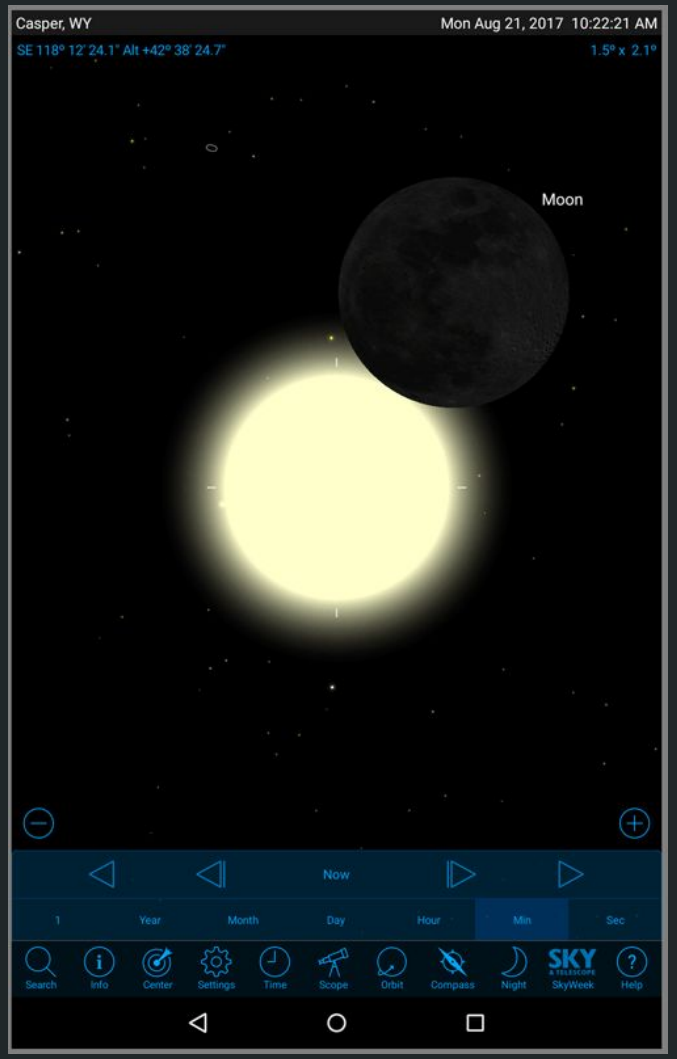
Eclipse Phases

Simulated views* from Casper, Wyoming

* Android SkySafari 4+

Simulated view* from Casper, Wyoming

* Android SkySafari 4+



The 2017 eclipse will be at about the same point in the solar cycle as the 2006 eclipse. A quiet sun will bring long coronal streamers.

Why You Should See THIS Eclipse

- It’s the first eclipse to touch the continental U.S. since 1979
- It’s easy to get to it
- Stuff we (U.S. residents) don’t have to worry about:
  - Limited transportation options
  - Passport
  - Visas
  - Inoculations
  - Foreign currency
  - Political instability *

If you've never seen a total solar eclipse, here's why you must see one in person at least once...

- Photos and videos don't have enough dynamic range to represent what you actually see during a total eclipse.
- Seeing the sun in H-alpha is not the same as the view during a total eclipse. Prominences have an "electric" pink color visually because you're seeing more than h-alpha red.
- Seeing the corona visually is only possible during a total eclipse.

More reason to see a total solar eclipse in person at least once...

- Rapid environmental changes (temperature, wind, sky color) must be experienced.
- The “social” experience is unique - an opportunity to meet and celebrate with people from all over the world.

Note: If you *think* you've seen a total solar eclipse, you probably haven't. Annular eclipses or partial eclipses (even deep ones) are not the same as a total eclipse.

What Kind of Observing Do You Want to Do?

The different ways to observe the solar eclipse:

- Visually - No photo equipment, no pressure. Great for viewing with family and friends and a great social experience. Virtually any unobstructed site that can accommodate your group will be fine.
- Casual photography - wide-angle lens, DSLR, fixed tripod. Do it with friends and family.

If you are organizing your own mini-tour group, please DON'T force anyone reluctant about the event to come. The other members of the group and even groups around you will thank you!

More ways to observe the solar eclipse:

- Serious photography - telescope, tracking mount, batteries, multiple cameras - lots of pressure to find a good clear spot several hours in advance, lots of praying for the sky to be clear for 3 hours! Best done away from others.

If you are a serious photographer, I think you should definitely drive to the eclipse. Not only will it give you the option to re-position yourself before the eclipse, but will avoid the considerable security problems, rough handling, and expense of air transporting your equipment.

The standard advice for first-time eclipse observers is to just sit back and enjoy it. i.e. don’t attempt photography.

I completely disagree with this!

If you want to come back with a photo, by all means go for it! Make the effort to do some planning, including leaving some time to step back and look at the eclipse. And if something goes wrong, make the best of it -- sit back and enjoy the show.

If you plan to photograph the eclipse, you need to find a good site for your equipment. Here are some selection considerations:

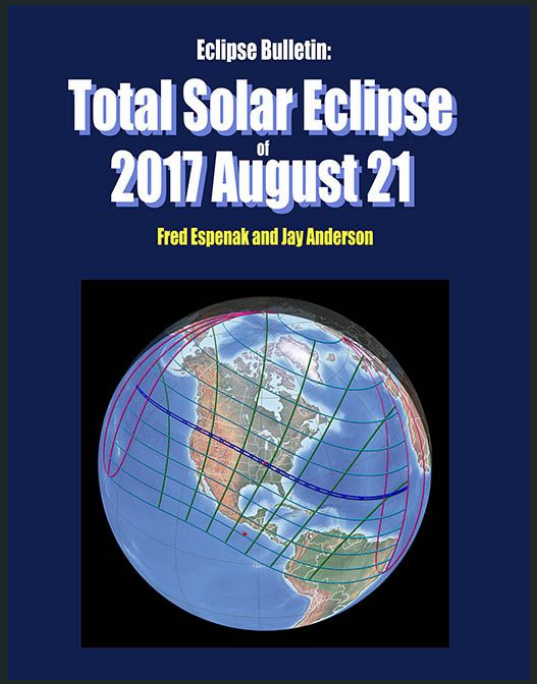
- Weather
- Terrain
- Accessibility
- Crowding
- Support Facilities

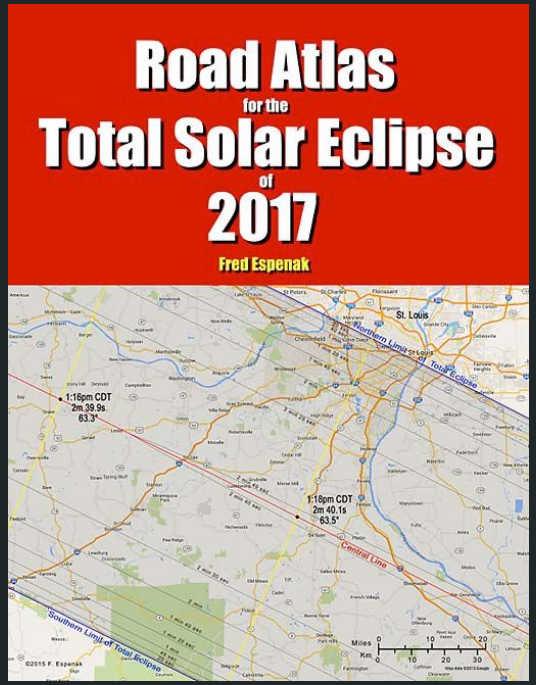
Primary resources:

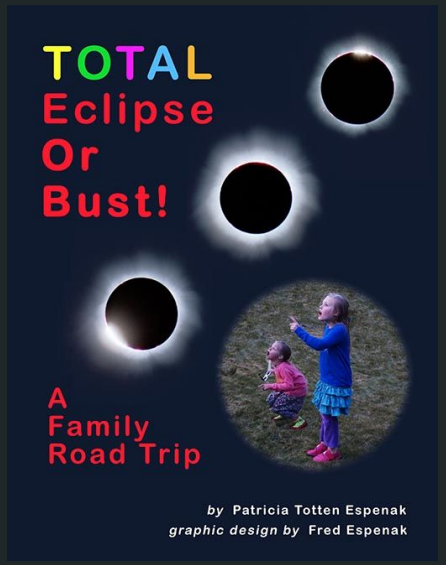
- Eclipse info from NASA / Fred Espenak - http://eclipse.gsfc.nasa.gov/SEgoogle/SEgoogle2001/SE2017Aug21Tgoogle.html
- New eclipse website by Fred Espenak - http://eclipsewise.com/
- Weather info from Jay Anderson - http://home.cc.umanitoba.ca/~jander/tot2017/tse17intro.htm

More internet resources:

- eclipse2017.org - http://www.eclipse2017.org/2017/path_through_the_US.htm
- TimeAndDate.com - http://www.timeanddate.com/eclipse/solar/2017-august-21







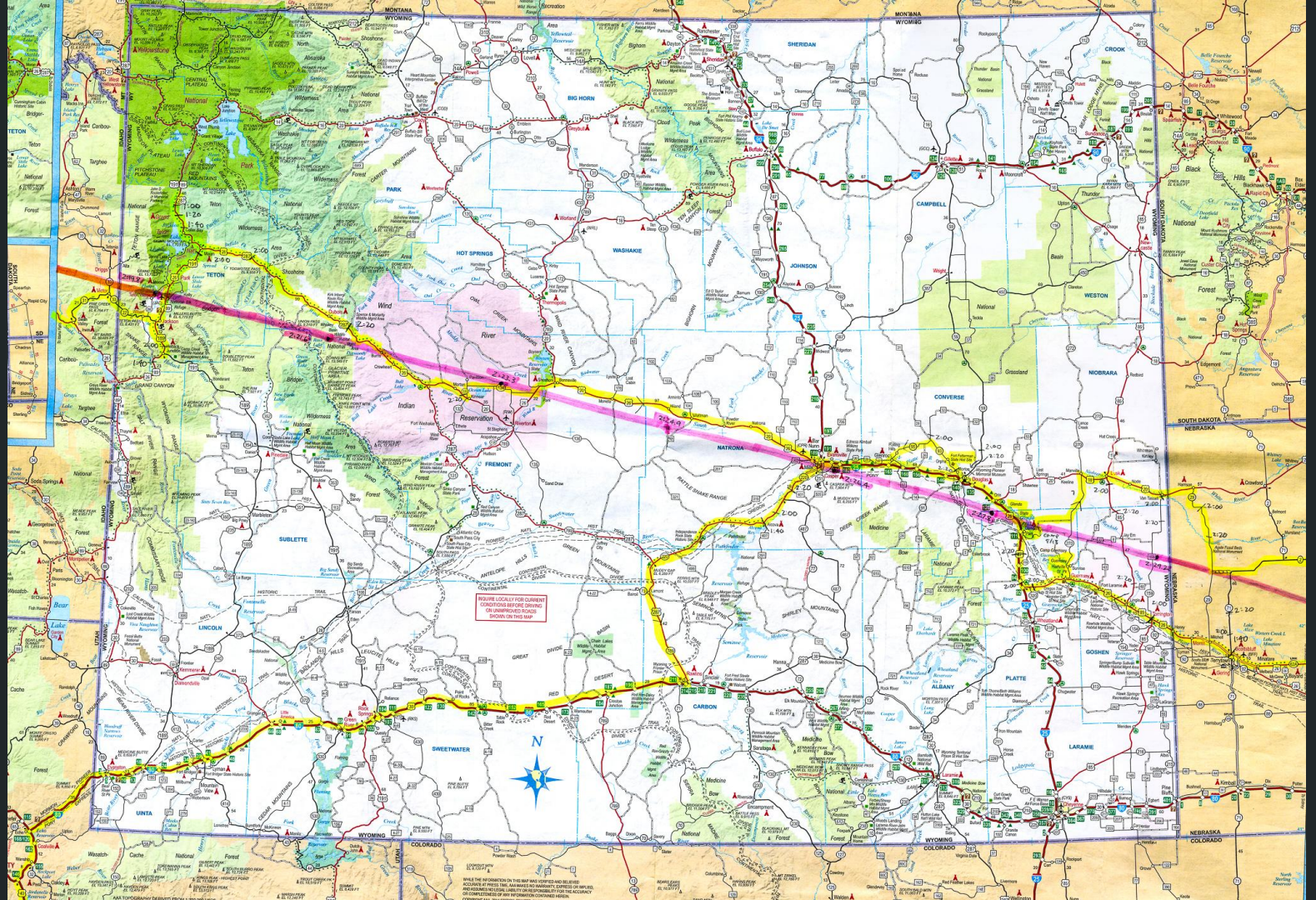
Two paper-only publications with all the nitty-gritty details for the 2017 eclipse plus a book for first-time eclipse chasers.

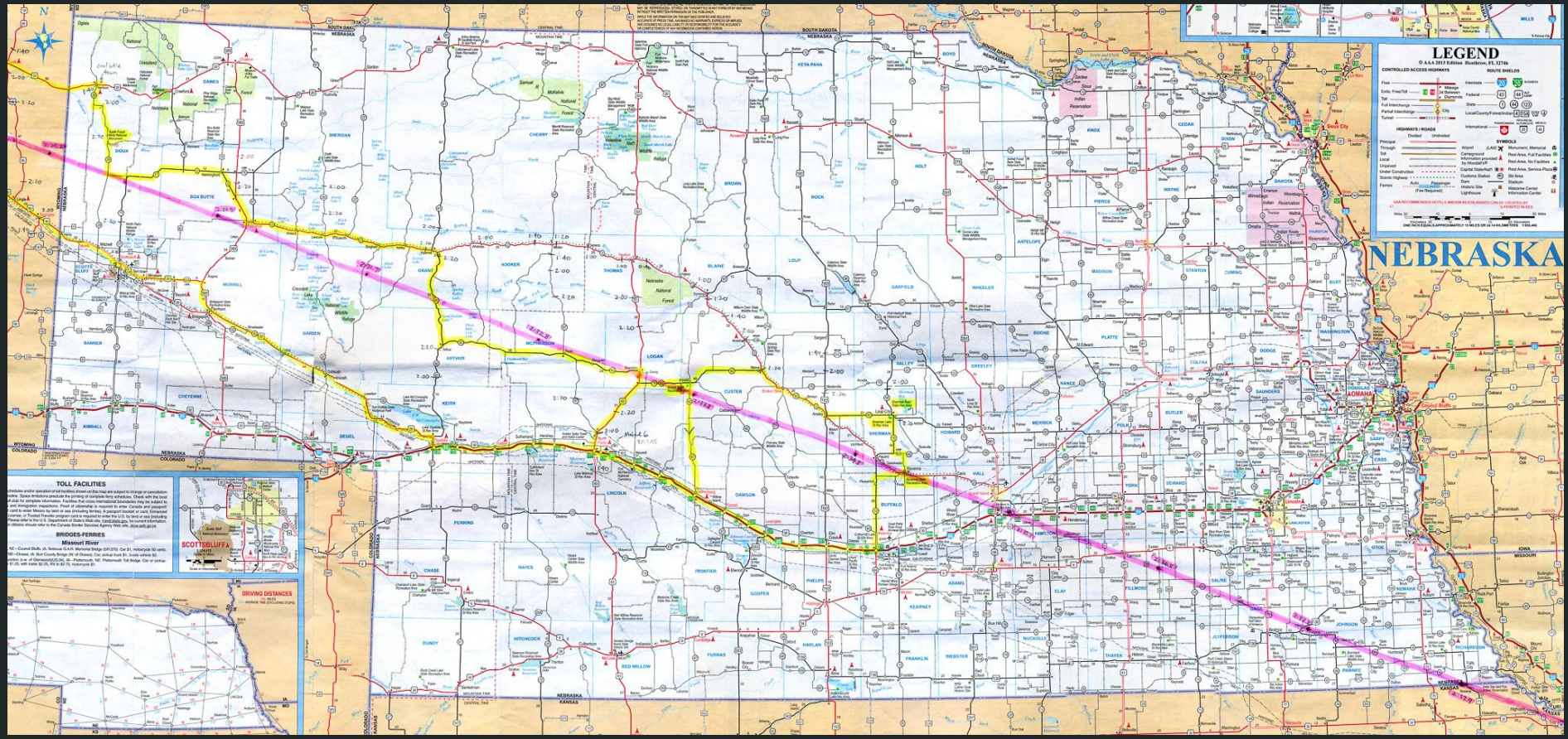
Order directly from: http://www.astropixels.com/pubs/TSE2017.html Dr. Espenak also offers a price break on volume orders, so let me know if you are interested. I'm putting together a volume order for club members.

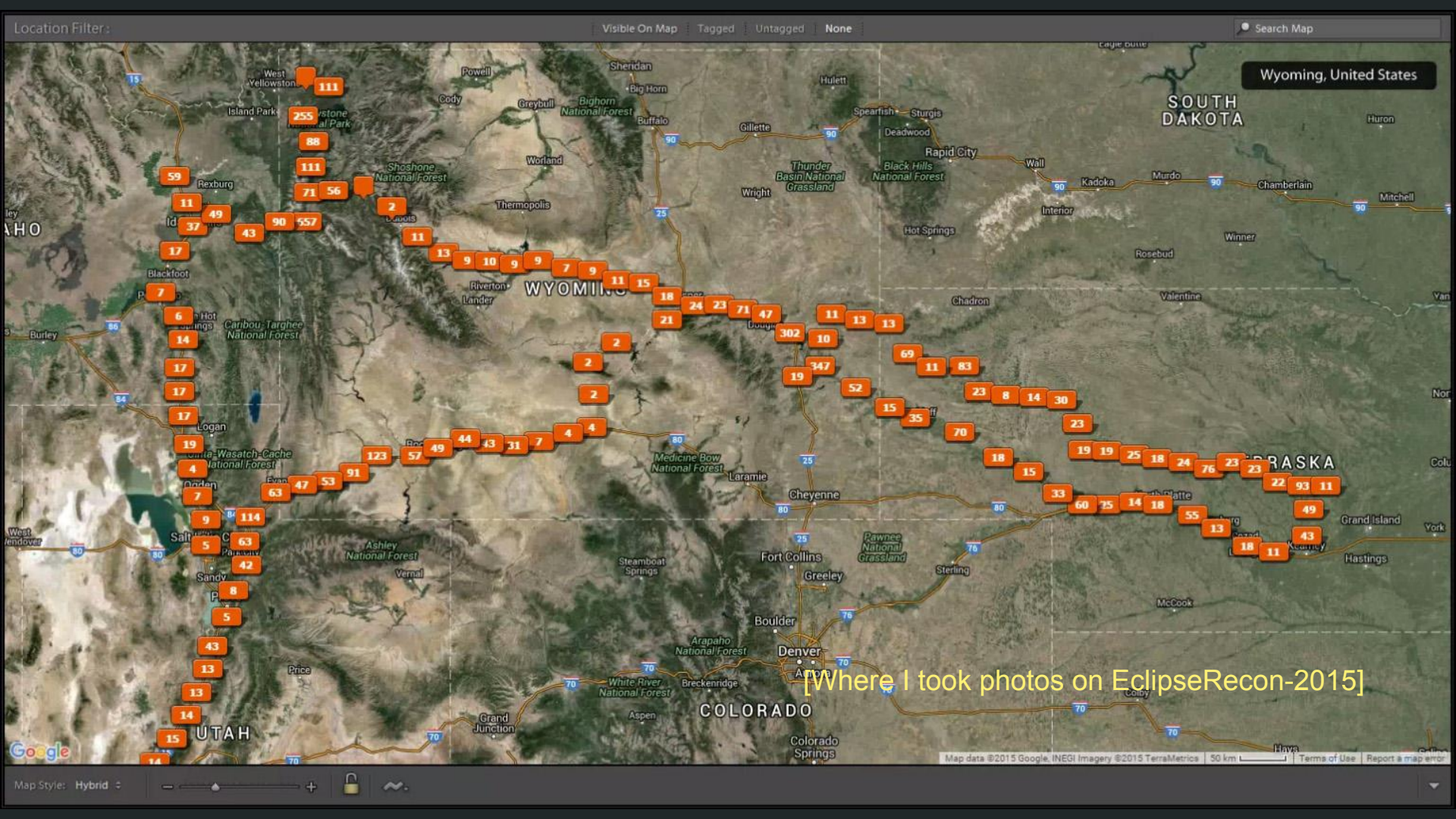
For the 2017 eclipse, I wanted to see for myself what conditions were like at the potential observing areas.

Hence: **EclipseRecon-2015**, my road trip. This was a 10-day trip in mid-August to check out the eclipse track between eastern Idaho and central Nebraska.

On the maps that follow, the central track of the eclipse is highlighted in pink. The roads we explored are highlighted in yellow.


MONTANA
WYOMING
SHERIDAN
CROOK
BIG HORN
PARK
HOT SPRINGS
WASHAKIE
CAMPBELL
JOHNSON
WESTON
TETON
NIOBRARA
CONVERSE
NATRONA
FREMONT
SUBLETTE
LINCOLN
CARBON
ALBANY
GOSHEN
PLATTE
LARAMIE
SWEETWATER
UINTA
SOUTH DAKOTA
NEBRASKA
COLORADO
UTAH
Yellowstone
Grand Canyon
Wind River Indian Reservation
INQUIRE LOCALLY FOR CURRENT CONDITIONS BEFORE DRIVING ON UNIMPROVED ROADS SHOWN ON THIS MAP.
N


LEGEND
NEBRASKA
TOLL FACILITIES
BRIDGES-FERRIES
Missouri River
SCOTTSBLUFFA
DRIVING DISTANCES


Location Filter:
Visible On Map
Tagged
Untagged
None
Search Map
Wyoming, United States
[Where I took photos on EclipseRecon-2015]
Map Style: Hybrid
Map data ©2015 Google, INEGI Imagery ©2015 TerraMetrics
Terms of Use
Report a map error

EclipseRecon-2015 dashboard setup:

- Dash cam (top)
- Garmin Nuvi GPS (middle)
- His/hers Android cellphones with Google Maps (both sides of car stereo), one used for GPS logging
- GoPro (passenger-side dashboard)
- “Road Atlas for the Total Solar Eclipse of 2017” and AAA maps.

Note: **Don’t depend on only cell phones for navigation.**

GPS may work everywhere outdoors, but cell phone coverage (essential for map graphics and navigation directions) is still very spotty in rural areas.

Take good old AAA maps. Besides covering the U.S. well, they also very accurately designate road types. These aren’t even differentiated on Google Maps.

The Weather Factor

... The kind of August skies we are used to in southern California, and what we hope for on eclipse day, 2017. A totally clear, transparent sky (for around 3 hours around noon) is what we want so we can get the best view of the corona.

Here’s what I actually got when chasing solar eclipses in the past:

- 1991 (Hawaii) - Clouded out completely!
- 1999 (eastern Turkey) - Scattered puffy clouds, no eclipse obstruction
- 2006 (Libya) - Early morning fog, but clear at eclipse time
- 2008 (China, Inner Mongolia) - Thunderstorms 1 day prior, but clear at eclipse time
- 2009 (China, near Shanghai) - heavy clouds required last-minute change of location, eclipse seen successfully (barely) through hazy sky.
- 2010 (Easter Island) - Heavy downpour at dawn, still drizzling at equipment setup time, clear during entire totality, some clouds during final partial phase.
- 2012 (northern Nevada) - Clear during total phase of this annular eclipse, clouds during final partial phase.

CONCLUSION: Planning is important, but LUCK has the last word.

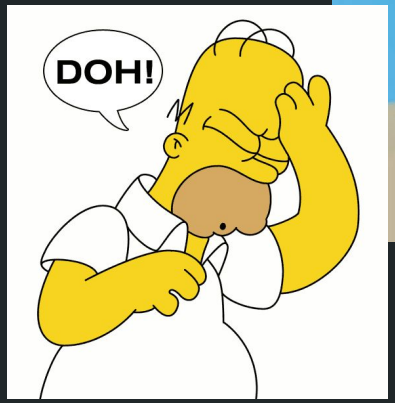
In Nebraska I asked a local ranger at a national monument what the typical August weather was like around noon.

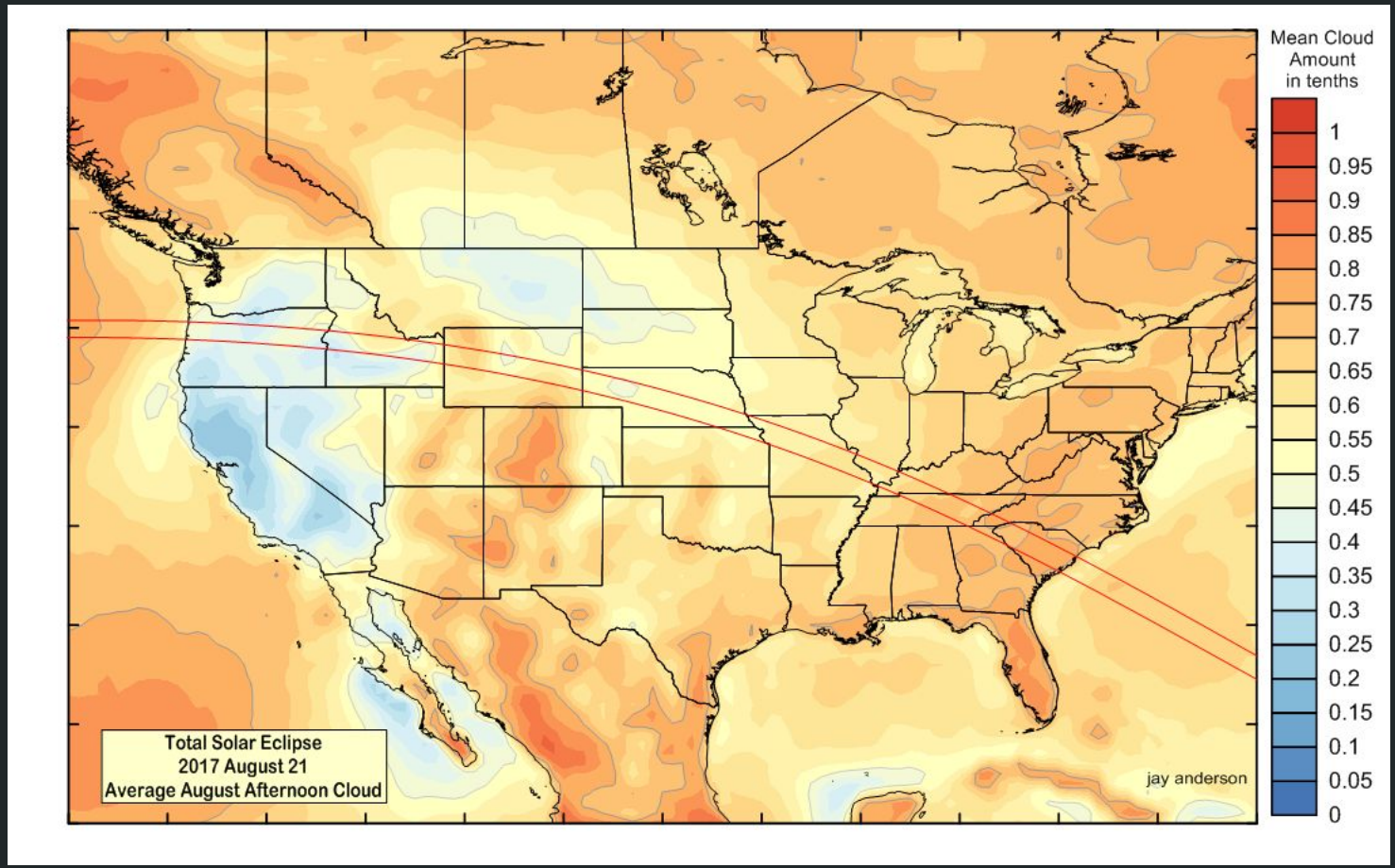
He said it was usually pretty clear, so I was optimistic.

But I asked him to elaborate a bit, and he told me … like in the “Simpsons” cartoon opening…

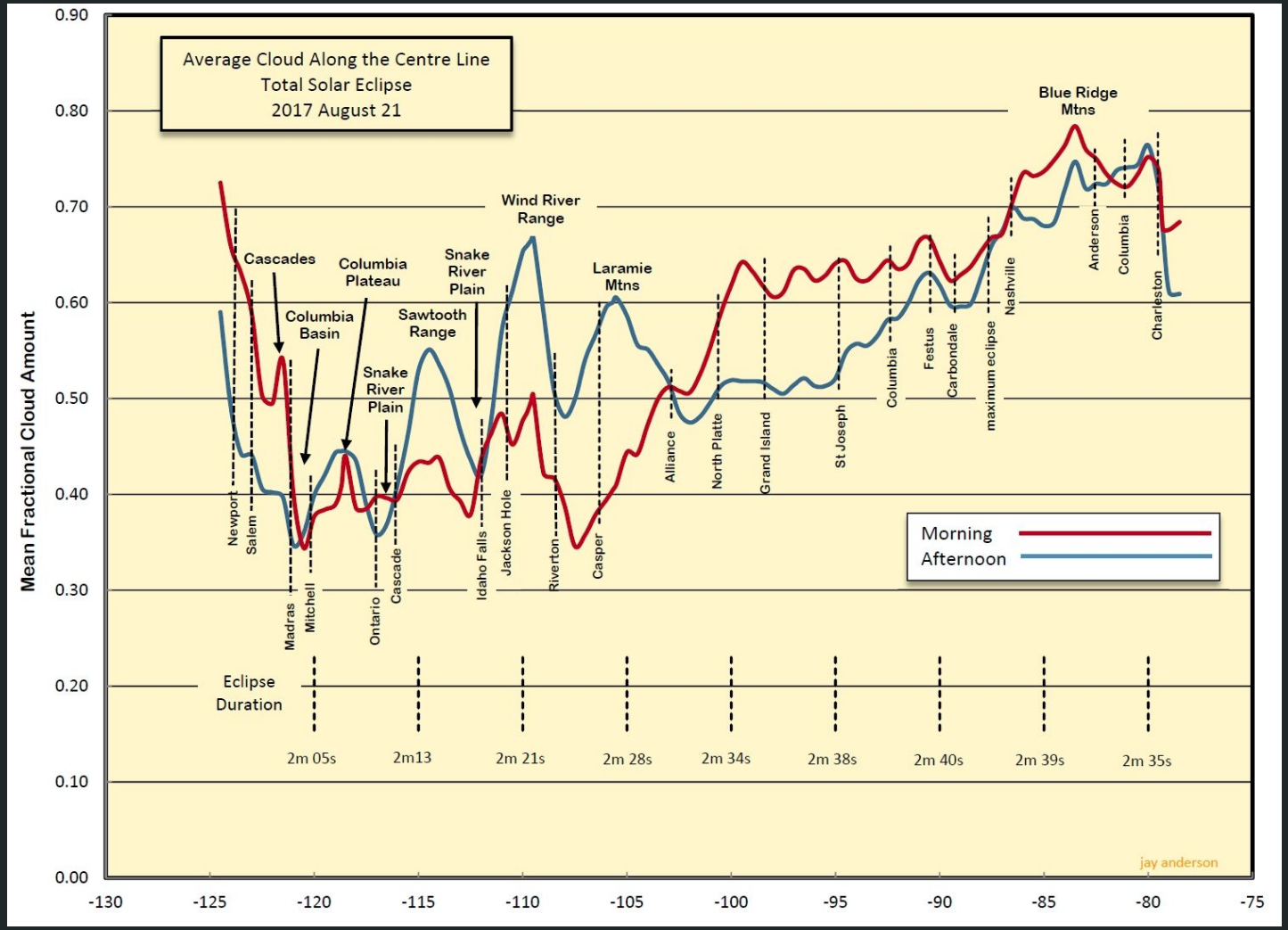
Agate Fossil Bed National Monument (Nebraska)


THE
SIMPSONS


DOH!



Official mean cloud coverage for Aug. 21 -- by Jay Anderson


Average Cloud Along the Centre Line
Total Solar Eclipse
2017 August 21
Mean Fractional Cloud Amount
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-130
-125
-120
-115
-110
-105
-100
-95
-90
-85
-80
-75
Blue Ridge Mtns
Wind River Range
Cascades
Columbia Plateau
Snake River Plain
Laramie Mtns
Columbia Basin
Sawtooth Range
Snake River Plain
Anderson
Columbia
Charleston
Nashville
Festus
Carbondale
maximum eclipse
Columbia
St Joseph
Grand Island
North Platte
Alliance
Newport
Salem
Madras
Mitchell
Ontario
Cascade
Idaho Falls
Jackson Hole
Riverton
Casper
Morning
Afternoon
Eclipse Duration
2m 05s
2m13
2m 21s
2m 28s
2m 34s
2m 38s
2m 40s
2m 39s
2m 35s
jay anderson

The problem with the mean cloud coverage plot is that it's an average. And we can't tell if that's typically due to a low-density general overcast, big puffy (opaque) clouds, or rapidly moving small clouds.

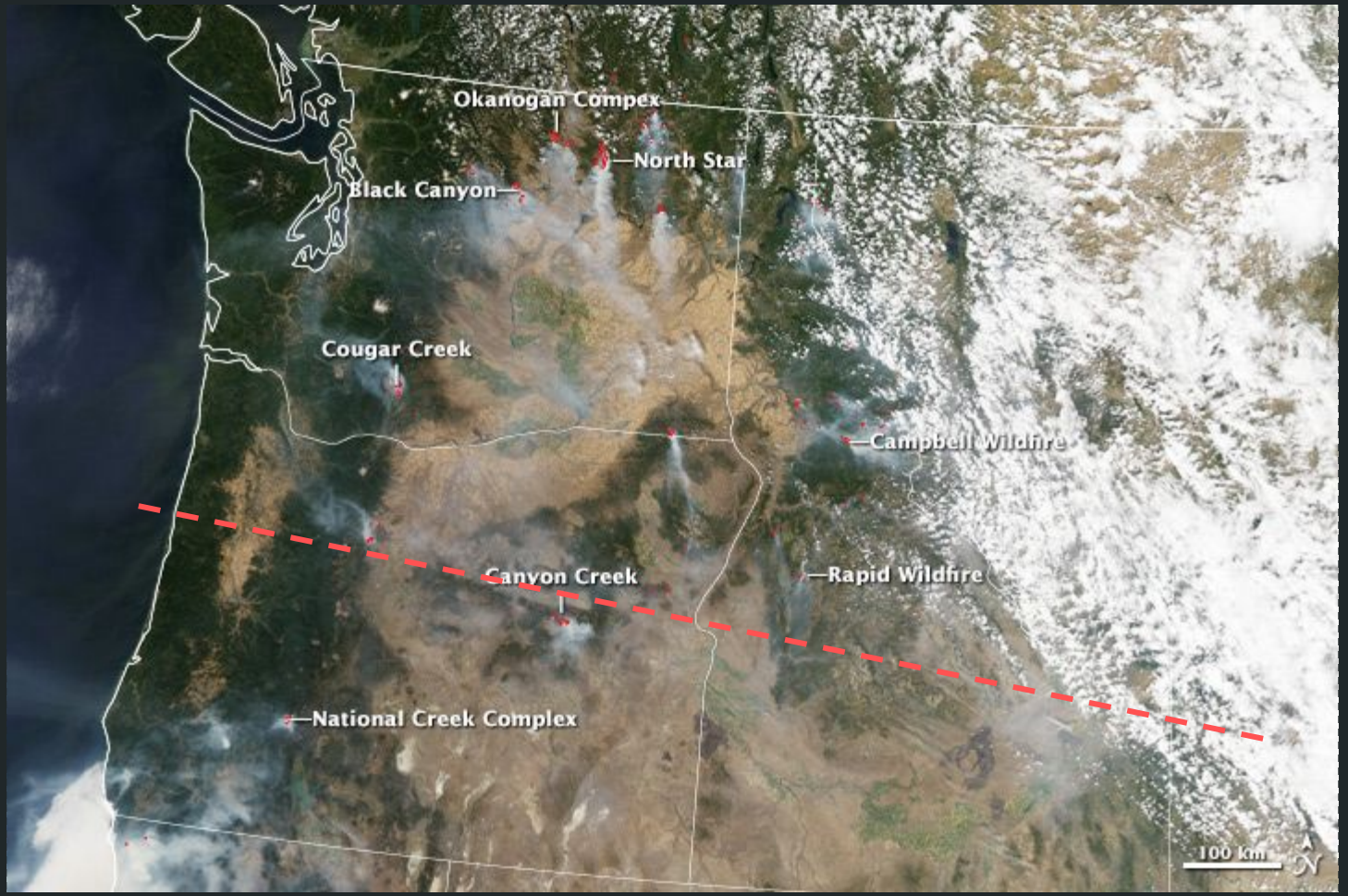
For mid-August, 2015, the weather was generally pretty unfavorable...

The Often-ignored “Weather” Problem -- Smoke and Dust

A potential problem in August is the possiblity of smoke in the air due to fires in the Pacific northwest. This year, smoke was visible in Wyoming from fires in Idaho, Oregon, and Washington. On our way back, we could see considerable haze in the air from about Salt Lake City and southward on I15.

Fires in the Pacific Northwest
18 Aug. 2015

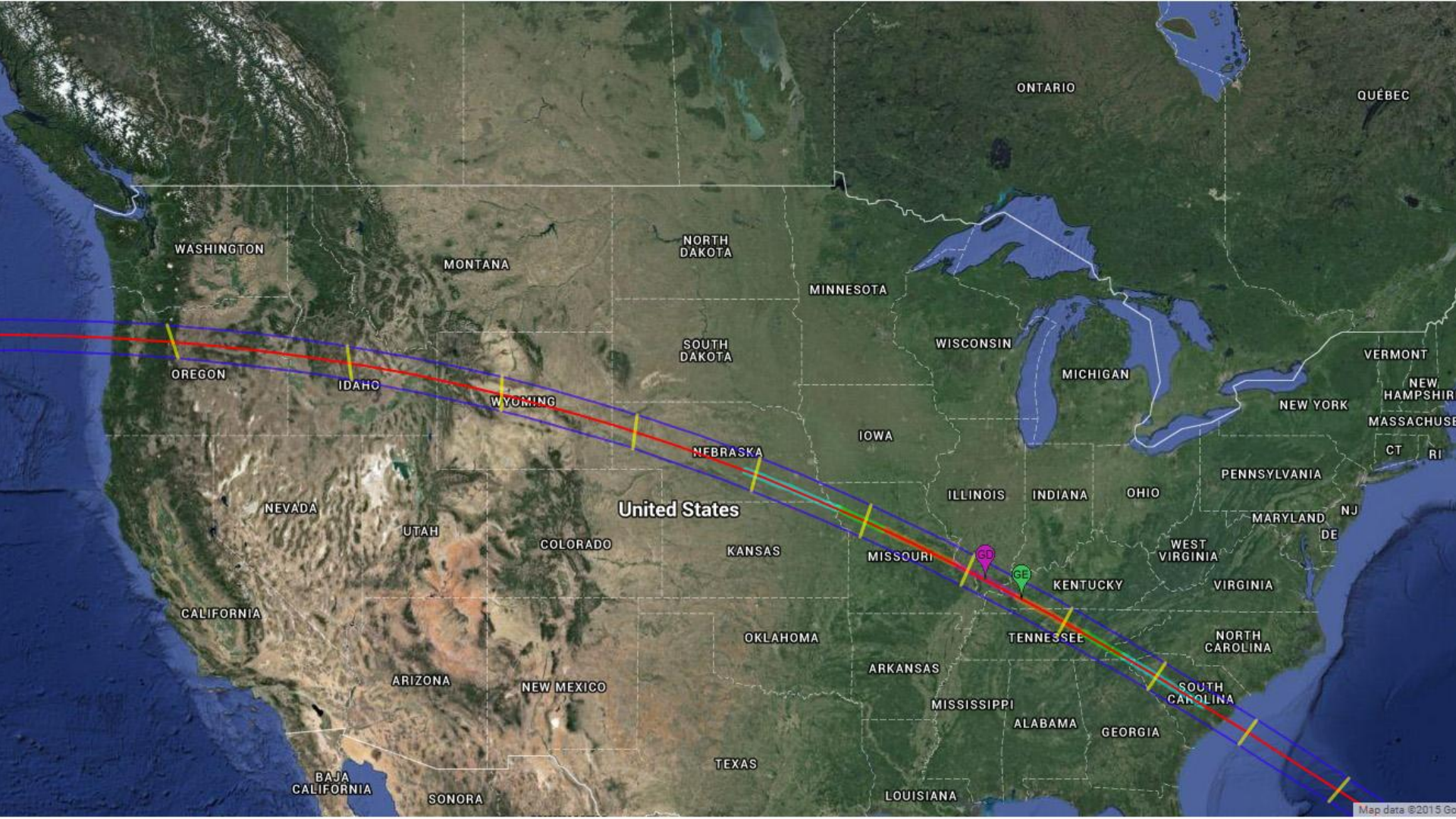
Approximate path of the eclipse centerline has been added.



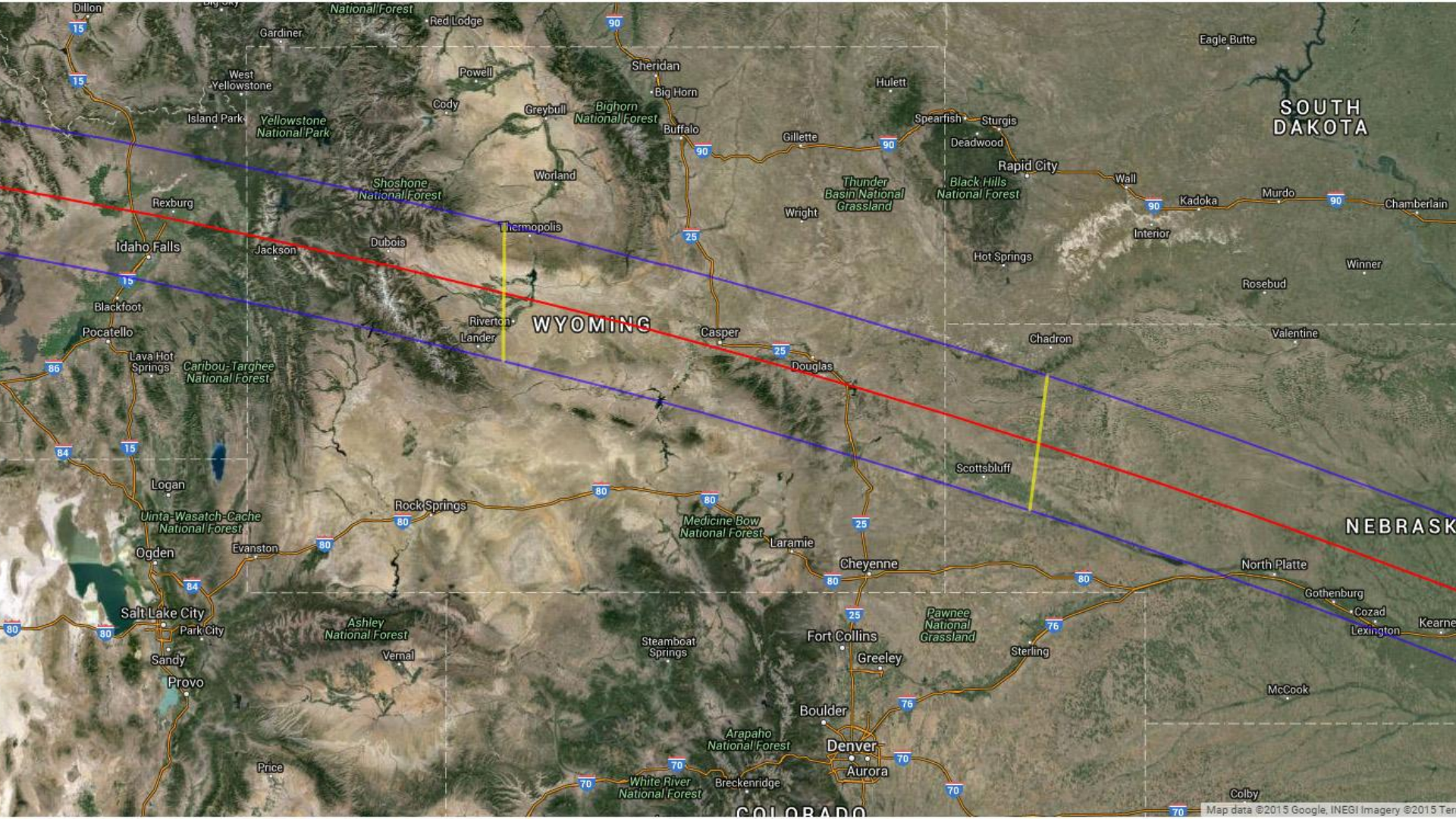
Conclusion: Weather will be a major worry.

With limited time for checking out the eclipse path, I'm concentrating my efforts on the part of the path west of the Mississippi River.

Large portions of the central U.S. are subject to cloud masses moving in from Canada or the gulf of Mexico. So the key to finding a clear location for photography will be mobility, with a possible final move having to be made as close as 12 hours prior to the eclipse.


ONTARIO
QUÉBEC
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
SOUTH DAKOTA
WISCONSIN
MICHIGAN
VERMONT
NEW HAMPSHIR
NEW YORK
MASSACHUSE
OREGON
IDAHO
WYOMING
IOWA
NEBRASKA
CT
RI
PENNSYLVANIA
ILLINOIS
INDIANA
OHIO
United States
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
MARYLAND
NJ
DE
WEST VIRGINIA
GD
GE
KENTUCKY
VIRGINIA
CALIFORNIA
OKLAHOMA
TENNESSEE
NORTH CAROLINA
ARKANSAS
ARIZONA
NEW MEXICO
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
TEXAS
BAJA CALIFORNIA
SONORA
LOUISIANA
Map data ©2015 Go

Terrain Considerations


Dillon
National Forest
Red Lodge
Gardiner
Eagle Butte
Sheridan
Powell
West Yellowstone
Big Horn
Hulett
Cody
Greybull
Bighorn National Forest
Island Park
Yellowstone National Park
Buffalo
Spearfish
Sturgis
SOUTH DAKOTA
Gillette
Deadwood
Rapid City
Shoshone National Forest
Worland
Thunder Basin National Grassland
Black Hills National Forest
Wall
Rexburg
Wright
Kadoka
Murdo
Chamberlain
Thermopolis
Idaho Falls
Jackson
Dubois
Interior
Hot Springs
Winner
Rosebud
Blackfoot
Riverton
WYOMING
Pocatello
Lander
Casper
Chadron
Valentine
Lava Hot Springs
Caribou-Targhee National Forest
Douglas
Scottsbluff
Logan
Rock Springs
Medicine Bow National Forest
Uinta-Wasatch-Cache National Forest
Laramie
NEBRASK
Ogden
Evanston
Cheyenne
North Platte
Gothenburg
Salt Lake City
Park City
Ashley National Forest
Fort Collins
Pawnee National Grassland
Cozad
Lexington
Steamboat Springs
Greeley
Sterling
Sandy
Vernal
Provo
McCook
Boulder
Arapaho National Forest
Denver
Price
Aurora
White River National Forest
Breckenridge
Colby
COLORADO
Map data ©2015 Google, INEGI Imagery ©2015 Ter

Generally, in the areas covered this summer, unless you were in the mountains within forested areas, major obstructions such as mountains are not a problem because the eclipse occurs with the sun high in the sky.

In the wide flat areas (central Wyoming and Nebraska), the best position would be up on a hill so that you can see the sun’s shadow approach and recede.

Grand Teton National Park and approximate position of the eclipse centerline. Virtually the entire area covered on the map above is within the path of totality.

Possible eclipse observing hazards -- northwestern Wyoming. This was taken at Yellowstone National Park. Staying close to the eclipse centerline should be OK as it is to the south, some distance away. Bear, elk, and wolves could be other hazards if you are located much north of the center line.

Accessibility

As it is clear from roadmaps, U.S. interstate freeways provide good accessibility to the eclipse line. But you can not stop on the freeway to observe the eclipse!

Generally, even the “side” roads in the area covered are good for mobility - two-lane undivided roads with little traffic and up to 60 MPH speed limits.

Shoulders can be a problem. Roads are crowned, have narrow shoulders, and merge into shallow ditches by the roadside -- leave the Lamborghini or stretch limo at home!

Unimproved roads are generally hard-packed like the road to the OCA's Anza site. But watch out if it rains!

For serious photography, we need to find not only a good spot to pull off the road, but also a flat area to set up equipment. A tarp (weighted against wind) is a good idea.

Don’t pick a spot far away from your vehicle! You might have to carry your equipment. Don’t assume you can wheel an equipment cart over open ground.

Dealing with Crowds

If you are in an area with many people around (e.g. a town) or traveling with a tour group, you may be attracting people with your equipment, so have some visual observing equipment to share, but mark off an area around photographic equipment with caution tape. Make it clear to everyone that during totality you will be busy!

Being near a crowd can be a good thing if you want audio for a video recording!

Beware of large (crazy) crowds. They may want to start a bonfire or barbecue to celebrate the eclipse! They also may be trying to take flash pictures.

Support Facilities

If you are traveling in a small group (e.g. couple of cars), especially with children, consider that restrooms should be nearby.

If you are organizing a large group (several cars of participants), you may need to pre-arrange an observing spot with a property owner. Adequate parking and restroom facilities need to be considered. Make arrangements NOW! Locals are becoming aware of the 2017 date. Hotels and public parks are already being booked.

2008 (China) - An eclipse late in the afternoon made it necessary to have a large observing area because of the possibility of being in someone’s sight-line. Fortunately this won’t be a problem at the 2017 eclipse.

Traveling With a Tour

In 1991, I attempted my first solar eclipse trip (Hawaii). Aside from the disappointment of being clouded out, I learned a valuable lesson…

Travel with a small tour arranged by an experienced eclipse chaser!

The 1991 trip was arranged by the Bishop Museum and involved hundreds, if not thousands of people! The short story is that it was a logistical nightmare! Never again!

Since my original “disaster” of a trip, I’ve traveled multiple times with two small* groups:

- Twilight Tours -- run by OCA member Joel Harris
- Spears Travel -- based in Oklahoma, run by Gary Spears with the help of Dr. Fred Espenak

* I consider “small” to mean no more than two tour buses

Things to remember about an eclipse tour...

- An eclipse tour might seem expensive, but remember that the tour operator is saving you a lot of time and effort. In most cases they need to take one or more trips to the site to arrange all of the details.

- Tour operators have to book hotels, observing sites, and transportation much farther in advance than normal travel agents. This means that between the time you book the trip and actually go on the trip, the hotel may change, prices may go up, etc.

Things to remember about an eclipse tour:

- A good tour organizer is making his best guess as to the weather prospects, but LUCK is involved. There are no guarantees!

- On all tours (even non-eclipse ones), there is always someone who is a pain in the *$$. The high stress of getting your equipment set up just right for an event with no second-chance will make things even worse. Try to take things in stride (or have lots of valium with you).

Things to remember about an eclipse tour, especially for photographers:

- Be sure to tell the tour organizer that you want to get to the observing site at least an hour before first contact so that you have enough time to set up your equipment.

- After 3rd contact (end of totality), all the newbies, kids, and ADHD-stricken observers will be packing up and wanting to leave! But you have over an hour more to go till 4th contact. Be sure to let a tour organizer know you will not move until then, and you'll need additional time to pack up afterwards.

A 2017 Eclipse Strategy

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Seriously, because of the need for flexibility, I don't expect to have a fixed itinerary with reserved spots. Instead, based on car camping and/or motels selected on the fly, here's a possible plan for homing into an observing site...

- Eclipse-5 days: Based on long-range weather forecasts, position near promising locations with option to move 500 miles the next day. Idaho Falls, ID, Jackson, WY, or Casper, WY might be suitable initial positions.
- E-4 days: Based on updated weather forecasts, adjust to best location with option to move 250 miles the next day.
- E-3 days: Rest and re-evaluate, scout additional locations if necessary.
- E-2 days: Relocate up to 100 miles. Weather forecasts should be more reliable at this point.
- E-1 day: Relocate up to 25 miles, select final position
- E-6 hours: Go to final location and begin setup
- E-3 hours: Ready to start shooting!

August 21, 2017... Be There!