Chaco Culture National Historical Park
International Dark Sky Annual Report Submitted September 2017

General Information and Outreach Statistics

Chaco Culture National Historical Park has continued to maintain a successful night sky program with increased focus on stewardship of our dark night skies. In addition to regular scheduled public programs including regular night sky programs every Tuesday, Friday, and Saturday evening, monthly moon walks, and special guest lectures we have conducted outreach to local communities bringing night sky appreciation to local elementary schools. The park's Interpretive staff has made every effort to inspire and educate our visiting public about Chaco's dark night skies.

This year, the park successfully put on its Second Annual Astronomy Festival. The event occurred over three days and highlighted the negative effects of light pollution while also sharing the amazing dark skies found in Chaco Culture NHP. A total of 21 programs were provided each day with an average of nearly 248 visitors a day attending. Guest speakers included award-winning photographer Stan Honda, who put on a night sky photography workshop. The coordinator of the Colorado Plateau Dark Sky Cooperative, Bettymaya Foott, who spoke about light pollution. Dr. Erica Ellingson of CU Boulder who presented a planetarium show about the history of astronomy in Chaco Canyon and author David Baron, who spoke about his recent book American Eclipse, which follows three scientists as they chase the 1878 total solar eclipse. In addition to our esteemed guest speakers, Chaco Culture National Historical Park was pleased to premier the short NPS film Starry Nights Over Chaco Culture NHP. This short film detailed the importance of our IDA Dark Sky Park designation. This collaborative effort was years in the making and the park was extremely pleased to be able to share. We hope this event will continue to grow so that we can share the dark skies of Chaco with vast audiences.

The Chaco Night Sky Program program has increased programs this year as we continue to see expanded interest in our dark sky programs. A total of 49 dark sky programs was provided to visitors this year. Chaco has maintained long standing partnerships with the Albuquerque Astronomical Society and the Friends of Chaco their support our dark sky programs is much appreciated.

Contact Information: Aron Adams, aron_adams@nps.gov or 505-786-7014 Ext. 226
Lighting:
* No new developments.
* Park has maintained the lighting standards adopted to minimize light pollution.
* There is no non-compliant lighting in the park.
* No additional territory was added to the park.

Communities:
* No known changes.

Sky Quality:
* Sky Quality data were collected. See table below.

<table>
<thead>
<tr>
<th>ID</th>
<th>Observation Date</th>
<th>Local Observation Time</th>
<th>Location Name</th>
<th>Latitude/Longitude</th>
<th>Comments on Location</th>
<th>Sky Conditions</th>
<th>Cloud Cover</th>
<th>Zenith 45°</th>
<th>Horizon</th>
<th>Average Direction</th>
<th>Other Direction</th>
<th>Internal Temperature (°C)</th>
<th>Ambient Temperature (°C)</th>
<th>Relative Humidity (%)</th>
<th>Notes</th>
<th>Observers Names</th>
</tr>
</thead>
</table>
10 10/25/2016 23:52 Water Tank "36° 01' 53" N 107° 54' 30" W" South of water tank
Milky Way visible, no moon, few clouds on horizon 1/4 21.38 21.18 20.92 21.16 East
Phil Varela, Leah White, Brandon Velivis
Grabowska

11 10/25/2016 23:55 Water Tank "36° 01' 53" N 107° 54' 30" W" South of water tank
Phil Varela, Leah White, Brandon Velivis

12 10/25/2016 23:59 Water Tank "36° 01' 53" N 107° 54' 30" W" South of water tank
Phil Varela, Leah White, Brandon Velivis

13 1/25/2017 19:41 Pueblo Alto Ruins "36° 04' 12" N 107° 57' 29" W" Pueblo Alto
wayside sign Milky Way visible, no moon, clouds low around horizon. 1/4 21.68 21.89 21.47
21.68 North -1 -5.6 65.1 Phil Varela, Leah White, Laura Johnston, Hilary

14 1/25/2017 19:58 Pueblo Alto Ruins "36° 04' 12" N 107° 57' 29" W" Pueblo Alto
wayside sign No moon, clouds moved in, covering more of sky 1/2 21.69 21.74 21.94 21.79
West -2 -6.9 75.8 Phil Varela, Leah White, Laura Johnston, Hilary Grabowska

15 1/25/2017 20:02 Pueblo Alto Ruins "36° 04' 12" N 107° 57' 29" W" Pueblo Alto
wayside sign No moon, clouds moved in, covering more of sky 1/2 21.70 21.78 21.63 21.70
South -2 -6.9 75.0 Phil Varela, Leah White, Laura Johnston, Hilary Grabowska

16 1/25/2017 20:06 Pueblo Alto Ruins "36° 04' 12" N 107° 57' 29" W" Pueblo Alto
wayside sign No moon, clouds moved in, covering more of sky 1/2 21.74 21.66 21.99 21.80 East
-3 -7 75.5 Pueblo blocking horizon Phil Varela, Leah White, Laura Johnston, Hilary
Grabowska

17 1/25/2017 20:43 Pueblo Alto Trail, Top of Crack "36° 03' 55" N 107° 58' 09" W" Top
of crack No moon. Clouds mostly around horizon 1/2 21.68 21.81 22.18 21.89 North
-1 -6.5 75.3 Phil Varela, Leah White, Laura Johnston, Hilary Grabowska

18 1/25/2017 20:48 Pueblo Alto Trail, Top of Crack "36° 03' 55" N 107° 58' 09" W" Top
-2 -6.5 75.3 Phil Varela, Leah White, Laura Johnston, Hilary Grabowska

19 1/25/2017 20:53 Pueblo Alto Trail, Top of Crack "36° 03' 55" N 107° 58' 09" W" Top
of crack No moon. Clouds mostly around horizon 1/2 21.64 21.76 22.08 21.83 South
-2 -6.5 75.3 Phil Varela, Leah White, Laura Johnston, Hilary Grabowska

20 1/25/2017 20:57 Pueblo Alto Trail, Top of Crack "36° 03' 55" N 107° 58' 09" W" Top
of crack No moon. Clouds mostly around horizon 1/2 21.66 21.65 22.05 21.79 East
-3 -6.5 75.3 Phil Varela, Leah White, Laura Johnston, Hilary Grabowska

21 1/25/2017 21:47 Water Tank "36° 01' 53" N 107° 54' 30" W" South of water tank
No moon. Clouds covering >75% of sky. 3/4 22.12 22.11 22.15 22.13 North
-1 -6.5 75.3 Phil Varela, Leah White
22  1/25/2017  21:52  Water Tank  "36° 01’ 53”” N 107° 54’ 30”” W”  South of water tank  No
moon. Clouds covering >75% of sky. 3/4  22.00 22.09 22.32 22.14  West  -1  -6.5  -75.3
Phil Varela, Leah White

23  1/25/2017  21:55  Water Tank  "36° 01’ 53”” N 107° 54’ 30”” W”  South of water tank  No
moon. Clouds covering >75% of sky. 3/4  21.91 21.93 22.43 22.09  South  -2  -6.5  -75.3
Phil Varela, Leah White

24  1/25/2017  21:59  Water Tank  "36° 01’ 53”” N 107° 54’ 30”” W”  South of water tank  No
moon. Clouds covering >75% of sky. 3/4  21.99 22.05 22.37 22.14  East  -2  -6.5  -75.3
Phil Varela, Leah White

30% Cloud cover, thick haze, bright stars visible.  1/4  21.58 21.56 21.65  East  21.60
Leah White, Kelly Richards

Same as E- haze slightly clearing, some dimmer stars coming into view  1/4  21.49  South
Leah White, Kelly Richards

27  4/17/2017  21:17  Pueblo Alto Ruins  "36° 04’ 12”” N 107° 57’ 29”” Pueblo Alto wayside sign
Same as south, clearing  1/4  21.6 21.31 21.45 21.46  West
Leah White, Kelly Richards

Hazy  1/4  21.65 21.56 20.60 21.27  North
Leah White, Kelly Richards

29  4/17/2017  22:00  Pueblo Alto Trail, Top of Crack  "36° 03’ 55”” N 107° 58’ 09”” W”  Top
of crack  Clouds only on horizon, haze is clearing, milky way and zodiacal light barely visible
Clear  21.70 21.58 21.43 21.57  South
Leah White, Kelly Richards

30  4/17/2017  22:02  Pueblo Alto Trail, Top of Crack  "36° 03’ 55”” N 107° 58’ 09”” W”  Top
of crack  Same as south  Clear  21.66 21.30 21.24 21.40  West
Leah White, Kelly Richards

31  4/17/2017  22:05  Pueblo Alto Trail, Top of Crack  "36° 03’ 55”” N 107° 58’ 09”” W”  Top
Leah White, Kelly Richards

32  4/17/2017  22:10  Pueblo Alto Trail, Top of Crack  "36° 03’ 55”” N 107° 58’ 09”” W”  Top
Leah White, Kelly Richards

33  4/17/2017  23:10  Water Tank  "36° 01’ 53”” N 107° 54’ 30”” W”  South of water tank
Leah White, Kelly Richards
Sky brightness appeared to minimally increase. The trend may only be transitional through development.
Park is looking into options for permanent sky quality monitors.

**Conservation/Research:**
There is no research being conducted that directly relates to night skies.

**Funding:**
* Park has recently hired a seasonal position to administer the night skies program.
* Friends of Chaco purchased a telescope mount for the park and funded commemorative pins.
* There are no grants currently to administer dark skies programming.
* Park will explore additional fund sources.