



Water is life: Building Relationships, Precipitation Networks, and Promoting Citizen Science on Tribal Lands

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Navajo Nation & Hopi Geography

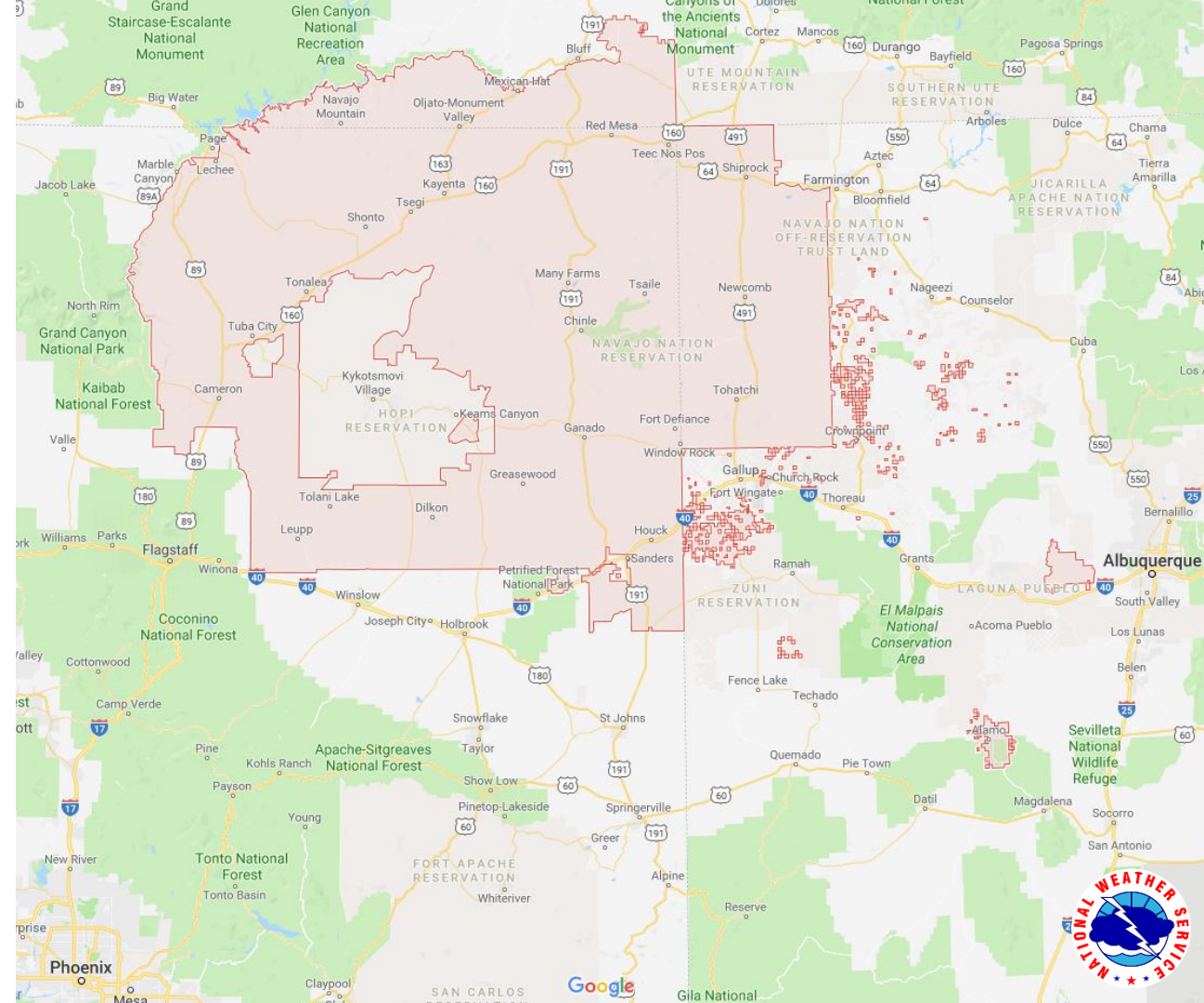
Land area

30,000 square miles

Population (2010)

NN: 173,667

Hopi: 7,185





Subsistence dryland farming and ranching

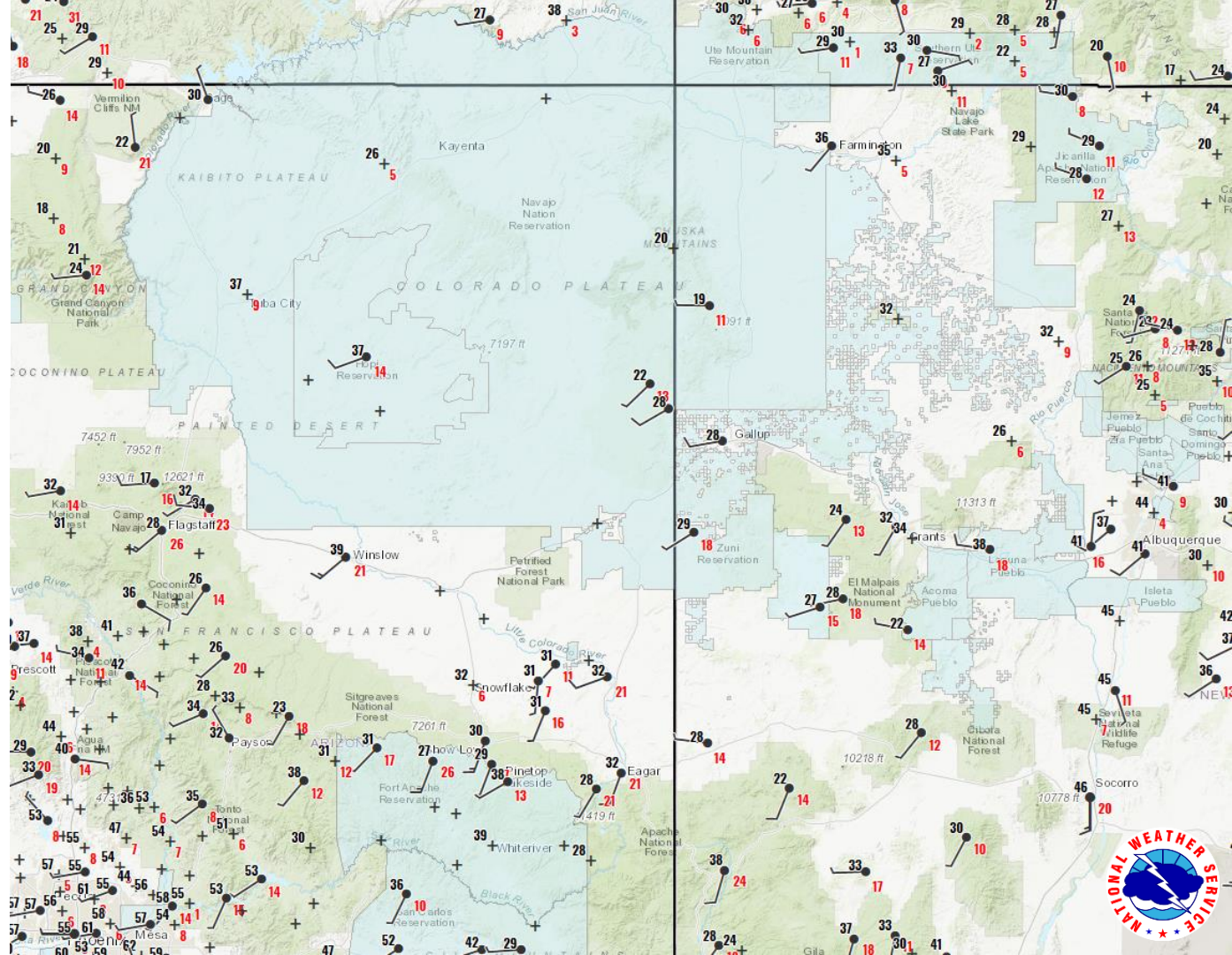
Water scarcity is the baseline normal.

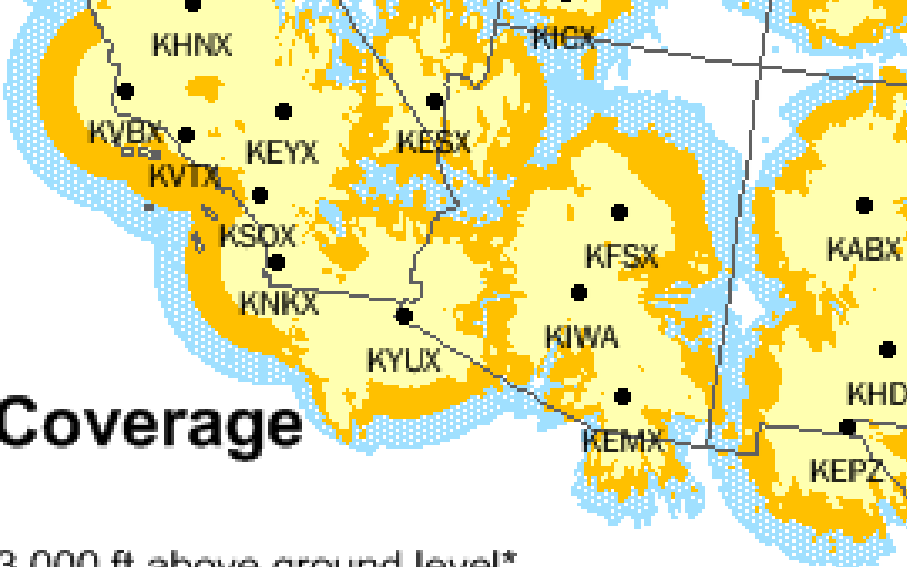
Any drought category has negative impacts to livelihoods



Drought conditions are difficult to assess due to

Very sparse in-situ observation network





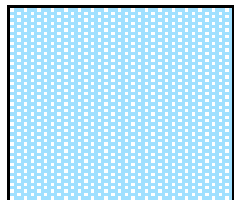
VCP 12 Coverage



3,000 ft above ground level*



6,000 ft above ground level*



10,000 ft above ground level*

Drought conditions are difficult to assess due to

Poor radar coverage



How to increase observations over the Four Corners?



COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK
"Because every drop counts"

Home | Countries | States | View Data | Maps My Data Entry | Login

Select Language ▾

Facebook | Twitter | YouTube

Welcome to CoCoRaHS! "Volunteers working together to measure precipitation across the nations."

CoCoRaHS - www.cocorahs.org

(Community Collaborative Rain, Hail, and Snow Network)



Obstacles	Solutions
Awareness	Cold calls/emails
Motivation/Interest	Measuring rain helps local community
Cost of a rain gage (\$40)	USDA funded
Daily internet access	Chapter houses have WiFi
Training	Provide free training and followup



Chapter Houses



Ts'ah Bii Kin



Chilchinbeto



Cove



Bodaway-Gap



Forest Lake



Black Mesa



Building Relationships with Tribal Partners

Be intentional about learning their culture and language

Find a link to weather in their culture and what we do

Yádiłhił Explorers Weather Poster

High Above

Cirrocumulus Cirrus Cirrostratus

In Between

Alto cumulus castellanus Alto cumulus Alto cumulus lenticularis

Near To Earth

K'os dilhił dahazhii' Cumulonimbus 'Ahi Fog Niyotsoh Tornado

50,000 ft
The Navajo word for "cloud" is k'os

30,000 ft
Al'aa anizabdi aldehoni' áago k'os vızhołgo bił' áahde'g' nıneeł' anígı'

Height of Cloud Base

As water, or "tó", moves through the water cycle, it changes state between liquid, solid, and gas. Since the water cycle is a continuous loop, all of the water that you see, splash in, or drink is recycled!

Meteorology is not just for scientists, or "na alkabi"! Navajo culture incorporates weather in many ways. Storm pattern rugs are the only Navajo rug pattern to depict a natural event. Four bolts of lightning extend from the weaver's home in the center of the rug to the four sacred mountains of "Dineebí", or Navajoland.

Weather is a part of Navajo hairstyles. Navajo people, or "Dineebí", tie their hair in a traditional hair bun or "soyveel". Their hair resembles dark clouds, while the white fabric holding the bun represents puffy white clouds. When the hair is let down from the bun, it resembles rain.

The Water Cycle

Diné Bizaad Weather Words

Sky	Yádiłhił	Lightning	li'ni'
Humidity	Aáh dilhił	Wind	Niyol
Sun	Jóhonaa' éi	Dust	Leezh
Intense Heat	Yéego deesdoi	Fire	Ko'
Intense Cold	Yéego deesk' aaz	Dew	Dahtoo'
Thunderstorm	Ni'di'ni'go hooltijił	Snow	Yas or zas
		Frost	Shoh

Natural phenomenon are respected living beings.
Male rain or *nı́tsá bik a'* is dynamic, with thunder and lightning.
Female rain or *nı́tsá bi' áad* is subdued, and brings life to the land.

Created by Natalie Panasiak for the National Weather Service, Flagstaff, AZ
www.noaa.gov www.weather.gov Follow us on Facebook and Twitter

Special thanks to Frank Morgan for translation, Brian Klimowski for weather and Native North American Indian - Old Photos for permission to use Navajo

Building Relationships with Tribal Partners

CoCoRaHS:
“Water is Life”

USDA funded
rain gauges



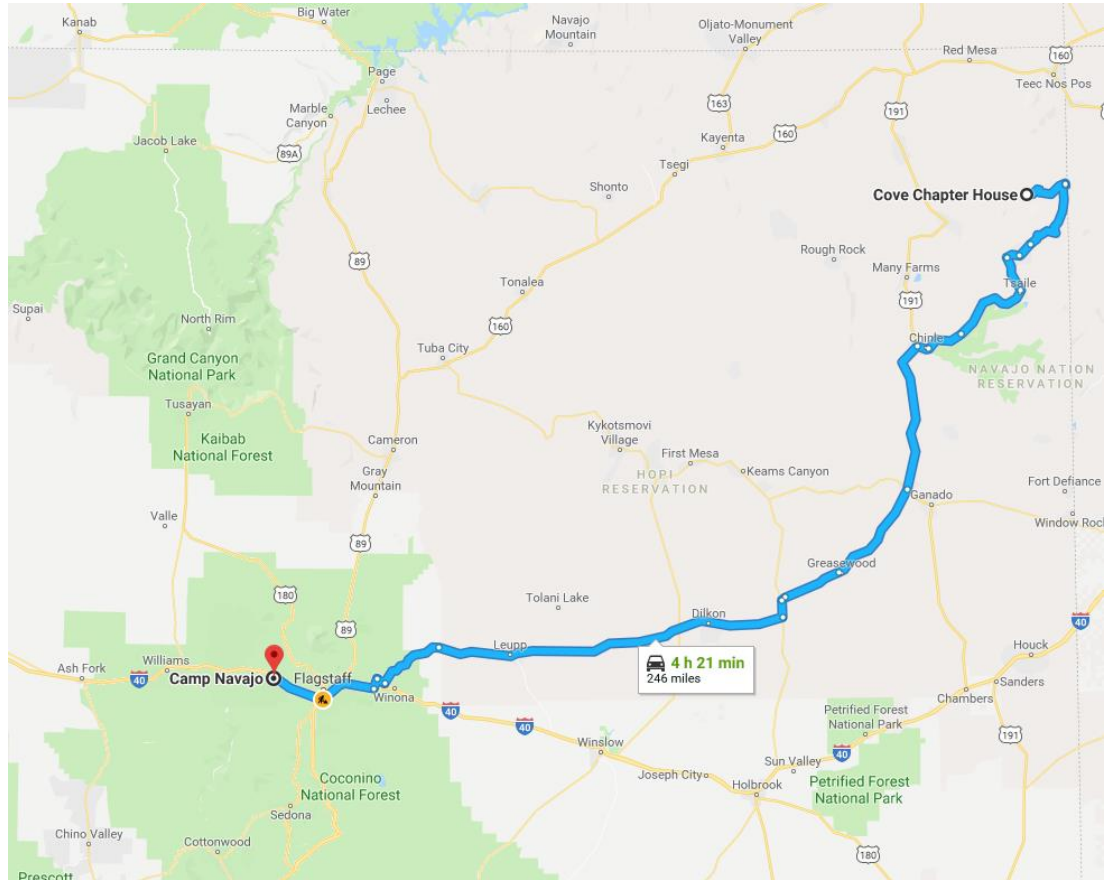
Building Relationships with Tribal Partners

Attend
Community
(Chapter)
Meetings



Building Relationships with Tribal Partners

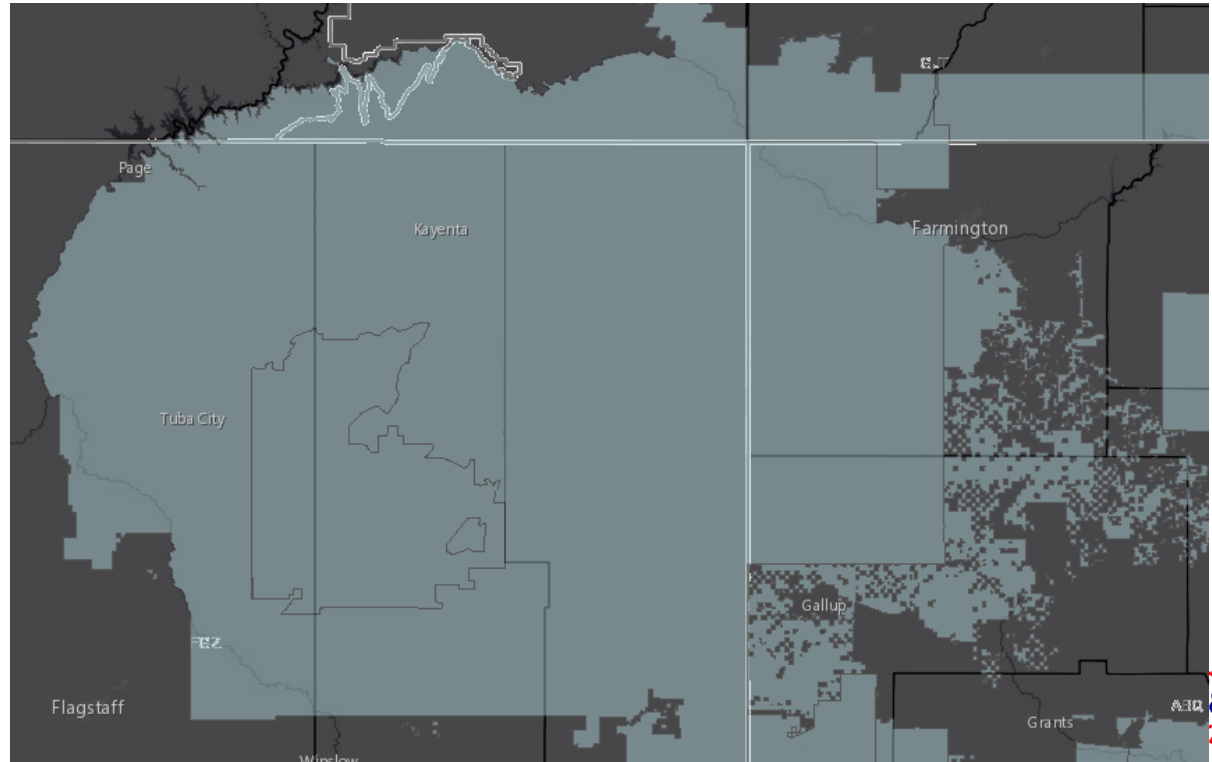
Make the effort



Needs Assessment

4 WFOs spread among 3 regions forecast for Navajo Nation

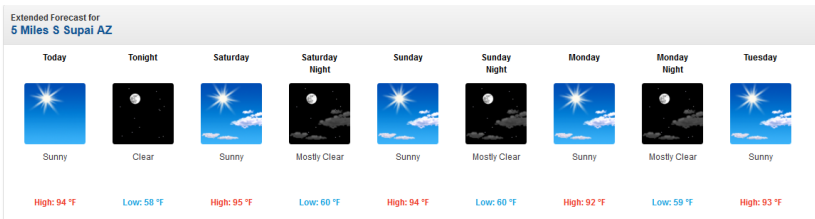
EM has to stitch the forecast together from 4 offices to establish common operating picture.



Needs Assessment

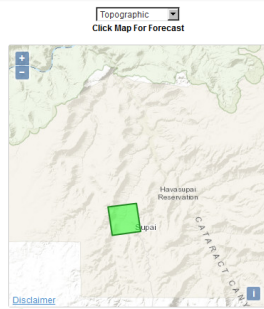
weather.gov searchable point forecast is not always accurate with its tribal (and non-tribal -- i.e. Phantom Ranch) location

Point and Click Search Result



Detailed Forecast

Today	Sunny, with a high near 94. Southwest wind 8 to 11 mph, with gusts as high as 18 mph.
Tonight	Clear, with a low around 58. Southwest wind around 6 mph becoming light and variable.
Saturday	Sunny, with a high near 95. South southeast wind 6 to 11 mph increasing to 12 to 17 mph in the afternoon. Winds could gust as high as 25 mph.
Saturday Night	Mostly clear, with a low around 60. South southeast wind 5 to 8 mph.
Sunday	Sunny, with a high near 94. Southwest wind 9 to 15 mph, with gusts as high as 23 mph.
Sunday Night	Mostly clear, with a low around 60.
Monday	Sunny, with a high near 92.
Monday Night	Mostly clear, with a low around 59.
Tuesday	Sunny, with a high near 93.
Tuesday Night	Mostly clear, with a low around 57.
Wednesday	Sunny, with a high near 91.
Wednesday Night	Mostly clear, with a low around 55.

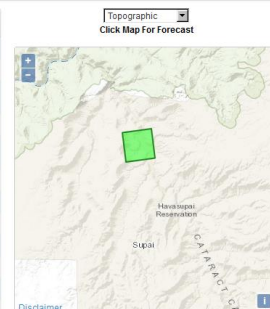


Actual Supai point forecast



Detailed Forecast

Today	Sunny and hot, with a high near 96. Southwest wind 7 to 11 mph, with gusts as high as 18 mph.
Tonight	Clear, with a low around 61. Southwest wind around 6 mph becoming light and variable.
Saturday	Sunny and hot, with a high near 98. South southeast wind 6 to 16 mph becoming southwest in the afternoon. Winds could gust as high as 25 mph.
Saturday Night	Mostly clear, with a low around 61. South southeast wind 5 to 8 mph.
Sunday	Sunny, with a high near 95. South southeast wind 9 to 15 mph becoming southwest in the afternoon. Winds could gust as high as 23 mph.
Sunday Night	Mostly clear, with a low around 62.
Monday	Sunny, with a high near 95.
Monday Night	Mostly clear, with a low around 61.
Tuesday	Sunny and hot, with a high near 96.
Tuesday Night	Mostly clear, with a low around 59.
Wednesday	Sunny, with a high near 93.
Wednesday Night	Mostly clear, with a low around 57.



Services to Meet Needs

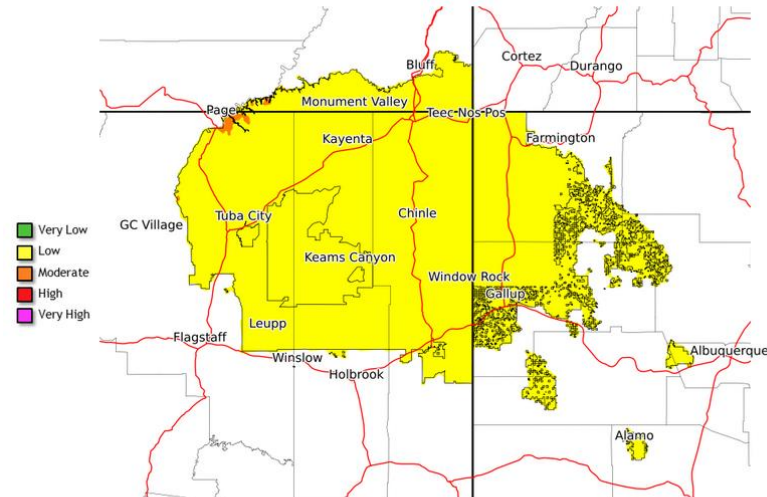
Navajo Nation Map Dashboard

- Categories developed with Navajo Nation EM
- Data from GFE
- Grid Image Maker
- Updated 4 times per day

Click on a colored box in the table below to view a risk map

Hazard	Fri Sep 14	Sat Sep 15	Sun Sep 16	Mon Sep 17	Tue Sep 18	Wed Sep 19	Thu Sep 20
Thunderstorms	Green	Yellow	Green	Green	Green	Yellow	Yellow
Dust	Green	Green	Green	Green	Green	Green	Green
Heat	Yellow	Orange	Yellow	Yellow	Yellow	Yellow	Yellow
Wind	Green	Green	Green	Green	Green	Green	Green
Cold	Green	Green	Green	Green	Green	Green	Green
Snow	Green	Green	Green	Not Available	Not Available	Not Available	Not Available

Heat Risk
Valid: September 15, 2018



<https://www.wrh.noaa.gov/fgz/NNWeatherRisk/>



National Weather Service
Flagstaff, Arizona
09/14/2018 05:13 AM MST

Follow Us:   
weather.gov/Flagstaff



Services to Meet Needs

Tribal Weather Dashboard

- Mobile-device friendly
- Sortable table
 - Alphabetical
 - WWA
- Click on square to drill down to the point forecast
- Each lat/lon was QCed

<https://www.wrh.noaa.gov/fgz/TribalWeatherDashboard>



Tribal Weather Dashboard

Page last updated 10:04 AM MST/11:04 AM MDT

Weather Threat Level Legend

-  No significant weather expected
-  A Watch is in effect
-  An Advisory is in effect
-  A Warning is in effect

Tribal Partners Weather Threat Level

Navajo Nation	
Havasupai	
Hopi	
Hualapai	
Kaibab-Paiute	
Tonto Apache	
White Mountain Apache	
Yavapai-Apache	
Yavapai-Prescott	

The Tribal Weather Dashboard is intended for National Weather Service core tribal partners



Questions?

