

Weather Synopsis

In the early morning hours (just before 4am MST) of September 26, 2019, a strong thunderstorm moved through the Spring Valley area in Yavapai County (Image A). A Severe Thunderstorm Warning was issued by the National Weather Service office in Flagstaff at 3:48 AM MST, continuing through 4:15 AM MST. Weak storm rotation was observed as the storm passed through the area (Image B). Damage to several mobile homes and at least one power pole was reported (Images C, D, and E). A storm survey was conducted by the NWS office, and it was determined that straight line winds around 75 mph existed at the time of the incident. These background images were used for this weather synopsis and as guidance for the remainder of the investigation.

NWS Storm Report

The following was indicated by the NWS Storm Report

- Approximately 20 mobile homes were damaged, with one no longer habitable. 4 homes suffered moderate damage.
- At least one power pole was snapped, and the area was without power for much of the morning.
- Several trees were estimated to have been damaged.

DATA COLLECTION

The following data artifacts were collected to perform the Meteorological Analysis. The collected data are official government records known to exist that the time of analysis. Any additional weather information that becomes available may be included into this report at a later time. Data was collected from the National Center for Environmental Information (NCEI). NCEI is responsible for hosting and providing access to world weather archives, with comprehensive oceanic, atmospheric, and geophysical data. NCEI is the leading government authority for environmental information.

Daily Weather Summaries

Daily weather summaries are archived data for hundreds of stations throughout the United States. High and low temperatures, significant weather conditions, and precipitation are typical measurements recorded in daily summaries. Daily weather summaries for April 12-14 are included in this report.

METARs/FMOs

METARs typically come from airports or permanent weather observation stations. Reports are generated once an hour or half-hour, but if conditions change significantly, a report known as a special (SPECI) may be issued. Some METARs are encoded by automated airport weather stations located at airports, military bases, and other sites. Some locations use augmented observations, which are recorded by digital sensors, encoded via software, and then reviewed by certified weather observers or forecasters prior to being transmitted. Observations may also be taken by trained observers or forecasters who manually observe and encode their observations prior to transmission. FMOs are the five-minute observation component to METARs, and are recorded separately. FMOs for the following locations were used in this analysis: Prescott, AZ (KPRC), Sedona, AZ (KSEC), Payson, AZ (KPAN), and Scottsdale, AZ (KSDL).

NEXRAD

NEXRAD is a network of 159 high-resolution S-band Doppler weather radars operated by the NWS. NEXRAD detects precipitation and atmospheric movement. Electro-magnetic beams return data which when processed can be displayed in a mosaic map, and show patterns of precipitation and its corresponding movement. The radar system operates in two basic modes, selectable by the operator: a slow-scanning *clear-air mode* for analyzing air movements when there is little or no activity in the area, and a *precipitation mode*, with a faster scan for tracking active weather. NEXRAD has an increased emphasis on automation, including the use of algorithms and automated volume scans. For this analysis the Flagstaff, AZ (FSX) radar was used. FSX was in precipitation mode at the time of the incident.

METEOROLOGICAL ANALYSIS

Overview

5 minute data show convective meteorological conditions. Our algorithms were applied to determine the estimated conditions for Spring Valley, AZ using data from the surrounding area. The distance to Spring Valley and elevation differences are taken into consideration by the algorithms. Because of the spatial nature of thunderstorms and the distance between observing stations, wind data from the doppler radar was also used.

Table 1 - Site Comparisons

Site	Distance to location (mi)	Elevation (feet)	Elevation Difference (feet)
KPRC	32.6	5367	+1427
KSEC	53.5	4350	+410
KPAN	86.0	5003	+1063

KSDL	77.1	1257	-2683
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Table 2 - FMOs (350-355 am)

Site	Wind Speed (mph)	Wind Gusts (mph)	Wind Direction
KPRC	5	--	NW
KSEC	14	20	NW
KPAN	11	15	NNW
KSDL	6	--	NE
FSX	45	55	NNW
Spring Valley	40	50	NNW

Table 3 - FMOs (355-400 am)

Site	Wind Speed (mph)	Wind Gusts (mph)	Wind Direction
KPRC	4	--	NW
KSEC	12	22	NNW
KPAN	8	--	NNW
KSDL	6	--	NNE
FSX	65	80	NNW
Spring Valley	65	75	NNW

Table 4 - FMOs (400-405 am)

Site	Wind Speed (mph)	Wind Gusts (mph)	Wind Direction
KPRC	0	--	N
KSEC	12	18	NNW
KPAN	3	--	N
KSDL	5	--	NE

FSX	55	65	NNW
Spring Valley	45	60	NW

Winds

The peak sustained winds were determined to be approximately 65 mph, with gusts exceeding 75 mph, out of the NNW.

CONCLUSION

A strong, very localized thunderstorm passed over the Spring Valley, AZ vicinity. The nearby stations were not sufficiently close to Spring Valley, therefore wind data from the NEXRAD was also incorporated into our algorithms. The determined wind speed (65 mph) and gusts (75 mph) matched very closely to the assessed conditions by the Flagstaff NWS office. Winds of this speed are sufficient to cause damage to trees, cosmetic damage to homes (i.e. loss of siding), and structural damage to lighter residences (i.e. mobile homes).

CERTIFICATION

I certify the information contained in this report is accurate to the best of my professional ability and that all expressed opinions, findings, estimations, and interpolations were made within a reasonable degree of meteorological certainty.

BACKGROUND IMAGES

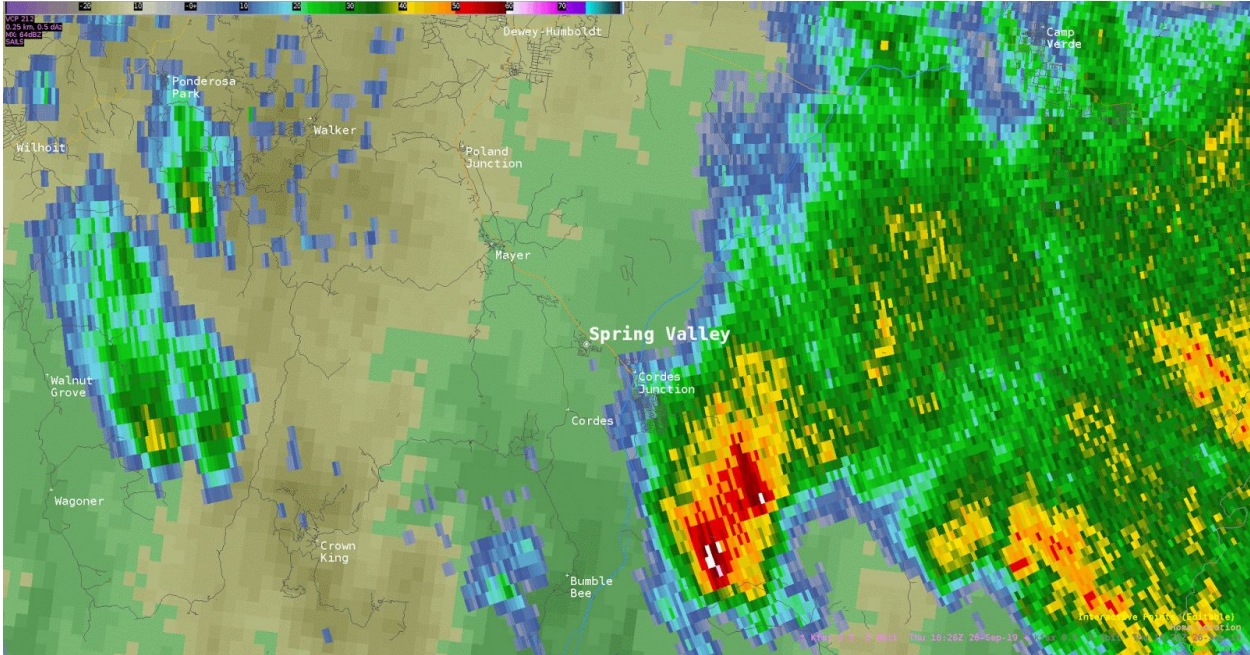


Image A - Radar Loop

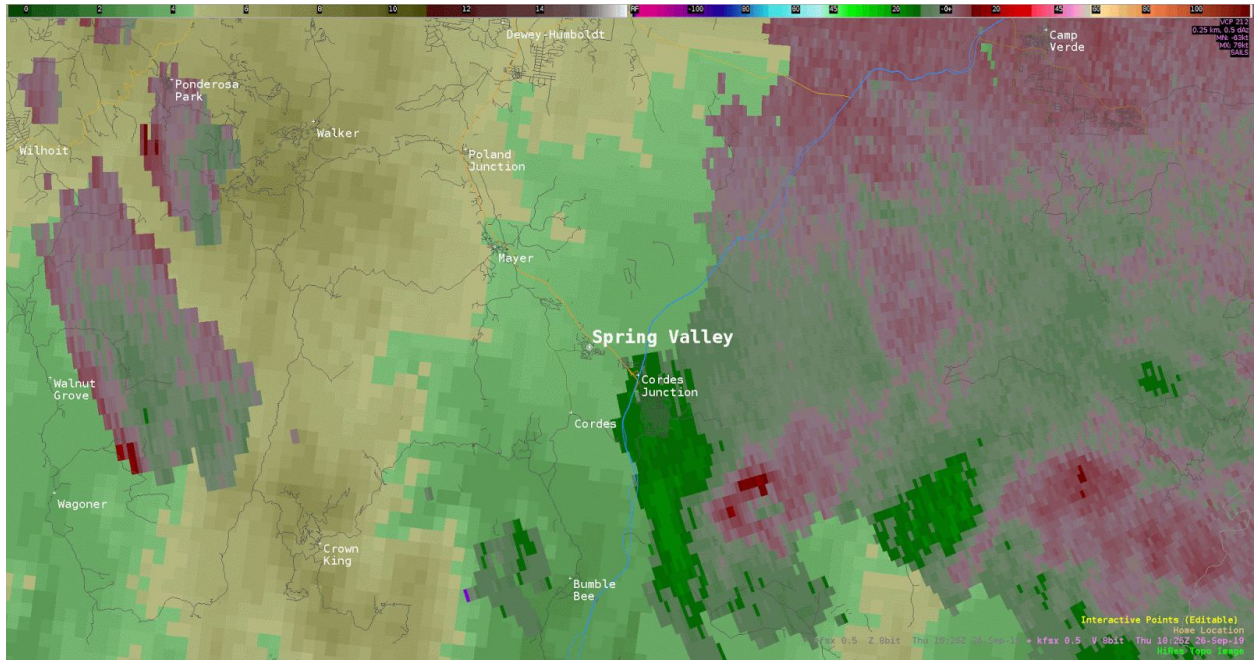


Image B - Velocity Loop



Image C - Storm Damage



Image D - Storm Damage



Image E - Storm Damage