

# History of Weather Observing at Fort Washita, Oklahoma 1842 - 1861

Current as of  
February 2005

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**This report was prepared for the Midwestern Regional Climate Center  
under the auspices of the Climate Database Modernization Program,  
NOAA's National Climatic Data Center, Asheville, North Carolina**

## **Executive Summary**

Fort Washita, OK was built in 1842 to maintain peace in southern and central Oklahoma and serve as a safeguard against disturbances that might arise out of Texas. Weather observations began soon after completion of the fort, with Army surgeons being the weather observers. The first observation was taken on Jul 12, 1842 and the last observation on Mar 31, 1861, as the fort was being abandoned by Federal forces prior to the Civil War.

Weather observations most likely were taken in the immediate vicinity of the hospital, and Fort Washita had two hospitals during its 18 year history. The first hospital was located in the southeast part of the fort, with a new hospital built approximately one-quarter mile north in early 1857.

No significant information was found regarding weather instruments used at Fort Washita. However, publications of the Army Surgeon General's Office in 1844, 1850, and 1856, provided general documentation of the observation process at forts for the period.

Based on the database at the National Climate Data Center, the weather observing record at Fort Washita was almost continuous from the first observation on Jul 12, 1842 through Jan 31, 1858 when the fort was ordered abandoned by the War Department. The fort was re-occupied and weather observations commenced Jan 1, 1859 and continued through Mar 31, 1861 when Federal forces permanently abandoned the fort prior to the Civil War.

## **Fort Washita Historical Overview**

Fort Washita was established in the "Choctaw-Chickasaw country" by the Doaksville Treaty of 1837, in fulfillment of promises to these tribes by the Federal Government of protection from the more aggressive tribes in western Oklahoma. The garrison was placed near enough to the Texas border to serve as a safeguard against any disturbance that might arise south of the Red River. Fort Washita was located on a knoll overlooking the Washita River (now the northern terminus of Lake Texoma), approximately 12 miles northwest of the current city of Durant, OK (Bryan County), and 15 miles north of the Texas border (see Figure 1).

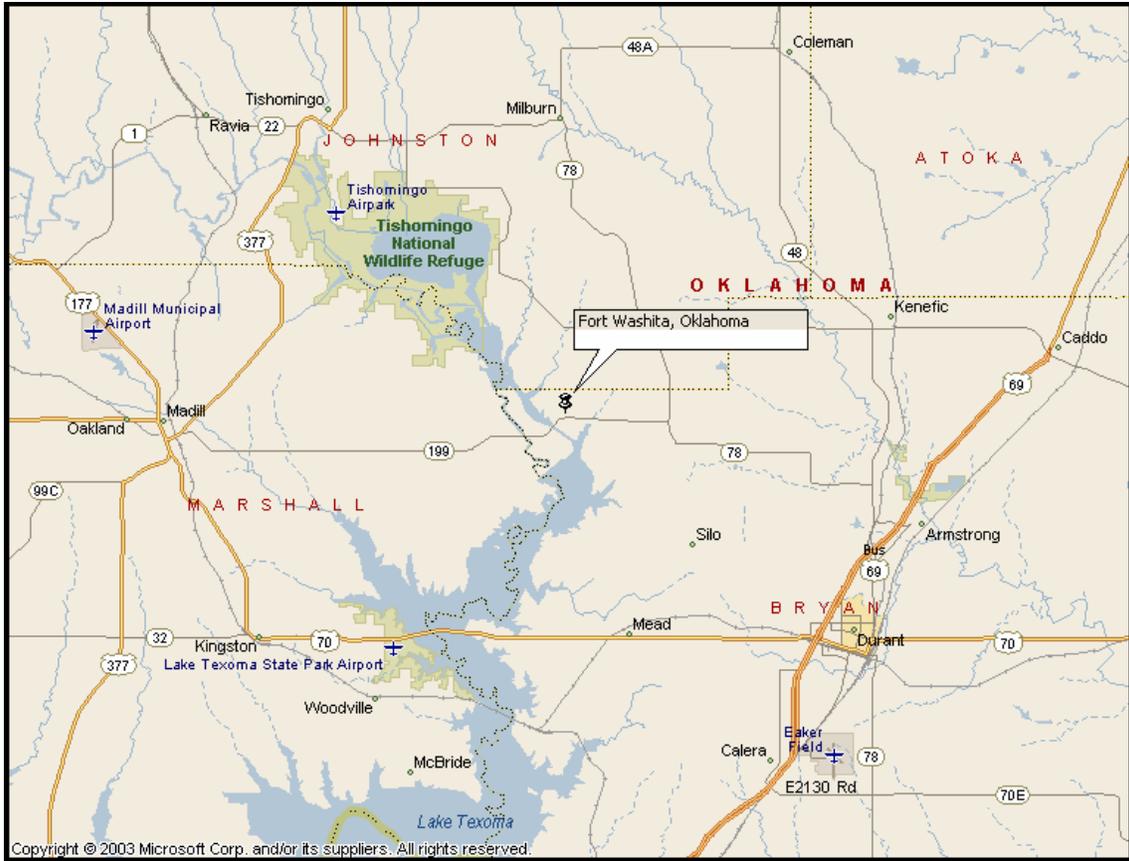


Figure 1. Location of Fort Washita on a current map of southern Oklahoma.

The Fort Washita site was selected by General Zachary Taylor in 1841. After surveying the area, the General selected a site on a knoll located one and one-half miles east of the Washita River. The fort was occupied in April 1842.

Construction was started by the 2nd Dragoons (soldiers capable of fighting as cavalry or infantry), but because of equipment and supply problems, progress was slow. Temporary log barracks were built in 1842 with more permanent barracks (built from shell-rock quarried from nearby hills) finished in 1850. Since most of the troops operating out of Fort Washita were cavalry and dragoons, extensive corral and stable areas were contained within the fort.

A small town developed near Fort Washita containing employees of the post and families of soldiers. The town was known at different times as Hatsboro or Rugglesville, with its existence dependent on the fort. The town was abandoned after Fort Washita was vacated.

Following the Mexican War and during the gold rush in California, Fort Washita became an important stop for settlers heading west. The fort was occupied consistently except for being abandoned February 17, 1858 through December 29, 1858 following instructions from the War Department.

Federal forces abandoned Fort Washita in 1861, soon after the capture of Fort Sumter in Charleston, South Carolina. Confederate forces from Texas subsequently occupied the fort, and it became a major supply depot. The fort was never again occupied by Federal forces.

Weather observations at Fort Washita (based on the National Climate Data Center database) were taken by U.S. Army surgeons, most likely in the vicinity of the hospital. This requirement of observing the weather by Army surgeons was mandated in 1814 by Dr. James Tilton, Surgeon General of the Army. Although the project grew slowly in the Army Medical Corps during the early 19<sup>th</sup> Century, by the 1840s, weather observations were important duties of Army field surgeons, including those at Fort Washita. The first observation was taken at Fort Washita on Jul 12, 1842 with the last weather observation recorded on Mar 31, 1861.

### **Location Descriptions**

Fort Washita was located on a north-south knoll with the Washita River immediately to the west, and approximately 70 feet below the fort. The east side of the fort was bordered by a north-south gully which emptied into the Washita south of the fort. Figure 2 shows the locations of the two Fort Washita hospitals, as well as the location of the Washita River and the two gullies near the hospital buildings.

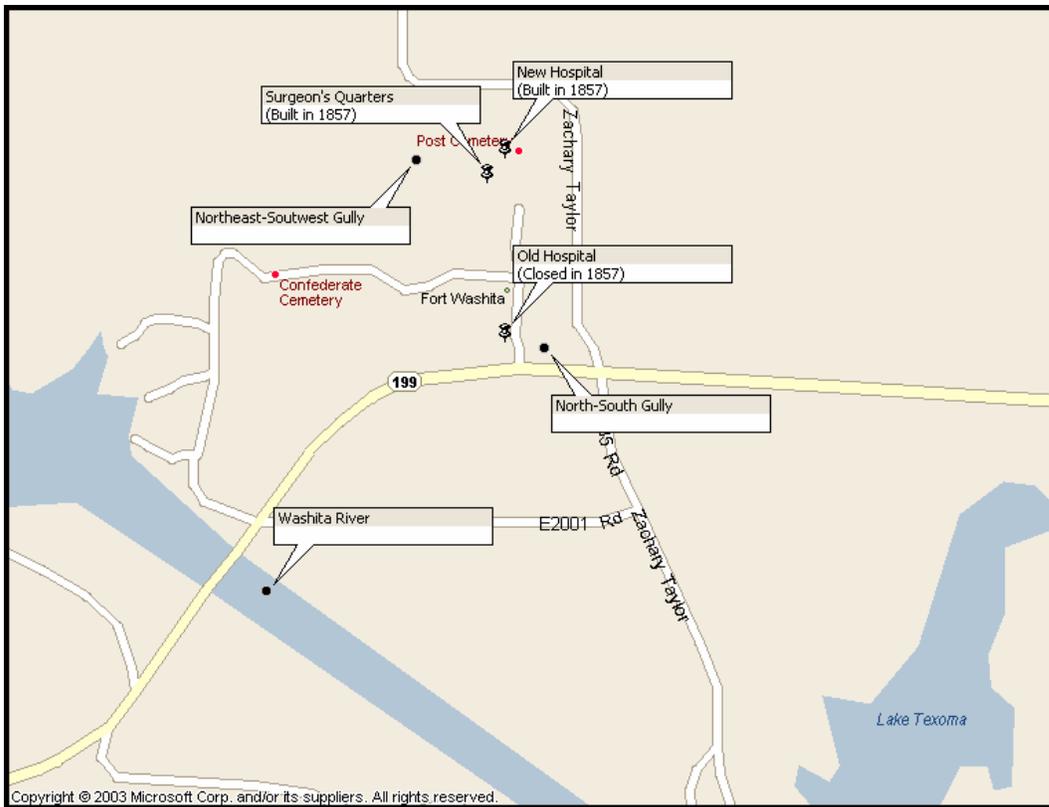


Figure 2. Location of Fort Washita hospitals, along with the Washita River, the north-south gully southeast of the old hospital building, and the northeast-southwest gully located immediately west of the new hospital building.

Weather observations from Jul 12, 1842 into 1857 were likely taken at the old hospital at the southeast part of the fort. Instructions from the Army Medical Department in the 1840s and 1850s do not indicate that weather observations must be taken at, or near the hospital, but an account by an Army field surgeon in 1867 at the Post Hospital at Carlisle Barracks Pennsylvania stated, “In the center of the hospital grounds stood the flagstaff with a weather cock, also a kiosk for the barometer, dry and wet bulb thermometers, and a suitable platform for snow and rain gages.” Sketchy reports from other forts indicate the hospital was the location for the weather instruments, primarily due to convenience, not necessarily regulations.

The old hospital was located on a slight southeast slope (Figure 3) that increased significantly approximately 50 yards southeast from the hospital and towards the gully (Figure 4). GPS coordinates for this site are 34°6’6”N 96°32’47”W with an elevation of 725 feet.

The building was small, consisting of two rooms, and was built from un-hewn logs. Military reports from the 1840s indicated the hospital to be orientated north-south, with

reports in the mid 1850s indicating an east-west orientation (consistent with current ruins), suggesting that the building likely was torn down and rebuilt at the same location.



Figure 3. Stone foundation remains of old hospital (center of picture) looking northwest. Reconstructed South Army barracks is in the background. Fort Washita weather observations likely were taken at this location from Jul 1842 through early 1857.



Figure 4. View from old hospital building looking southeast toward gully. Elevation drop from the hospital building to the bottom of the gully is approximately 30 feet. U.S. Highway 199 is shown on the right side of picture (highway oriented east-west).

In 1856 a new hospital was constructed approximately one-quarter mile north of the old hospital (see Figure 2). This hospital was constructed of brick and stone, was one story high, had eight rooms, and was surrounded by a porch. GPS coordinates for this building are 34°6'19"N 96°32'45"W with an elevation of 774 feet. The new hospital was located at the northern end of the post (Figures 5, 6, and 7) with terrain immediately behind the hospital (west) sloping approximately 50 feet to a gully below.



Figure 5. Stone foundation remains of new hospital (right side of picture) and surgeons' quarters (left side of picture). View is looking northwest.



Figure 6. Close-up of remains of stone foundation of new hospital. View is towards the northwest with the northeast-southwest gully in the background.



Figure 7. View of south direction from new hospital along the knoll containing Fort Washita and towards the old hospital.

Exact date is unknown when the surgeons moved to the new hospital, with military records suggesting the move occurred within the first few months of 1857. Military reports in 1856 state the new hospital was expected to be completed by Sep 1856, but a delay occurred due to lack of laborers.

### **Instrumentation Descriptions**

Specific information regarding number, type, location, and exposure of weather instruments used by Army surgeons at Fort Washita was not available. However, general inferences can be made from the monthly weather summaries, as well as from documented instructions from headquarters of the Army Surgeon General's Office.

#### Rain Gage

The following are instructions and information taken from a book published in 1851 entitled, *Meteorological Register: Observations Made by the Officers of the Medical Department of the Army at the Military Posts of the United States*:

“In 1836, rain gauges were furnished to many of the posts, by which the daily falls of rain and snow could be measured and entered upon the tables in inches and the fractions of an inch. The instrument employed is the conical rain gauge of De Witt; and observations are ordered to be made immediately after every shower or fall of rain or snow. The following are the instructions issued by the Department for its observers:’

‘The instrument used to measure the quantity of rain which falls, is the conical rain gauge. It will be kept remote from all elevated structures at a distance at least equal to their height, and still further off, where it can be conveniently done. It is to be suspended in a circular opening, made in a board, which is to be fixed to a post, eight feet from the ground; the opening to be five inches in diameter, and beveled, so as to fit the side of the gauge, into which the cap is to be fixed, base downwards, to prevent evaporation.’

‘In freezing weather, when the rain gauge cannot be used out of doors, it will be taken into the room, and a tin vessel will be substituted for receiving the snow, rain, or sleet that may then fall. This vessel must have its opening exactly equal to that of the rain gauge, and widen downwards to a sufficient depth, with a considerable slope. It should be placed where nothing can obstruct the descending snow from entering, and where no drift snow can be blown into it. During a continued snow storm, the snow may be occasionally pressed down. The contents of the vessel must be melted by placing it near the fire, with a cover to prevent evaporation, and the water produced poured into the gauge to ascertain its quantity, which must then be entered into the Register.’”

### Thermometer (Exposed and Wet Bulb)

Based on available information, Army field surgeons were given considerable flexibility in locating the station's detached (or exposed) thermometer. According to instructions from the Army Surgeon General in 1844:

“The Thermometer will be placed in a situation having a free circulation of air, not exposed to the direct or reflected rays of the sun, and sheltered from rain. Its situation should be remote from massy walls, which slowly imbibe or part with caloric. In making observations avoid breathing on the instrument, or touching it; and at night manage your lamp so as not to cause a rise of the mercury by its heat.”

NOTE – No changes occurred in the Army Surgeon General instructions with regard to the thermometer from 1844 through 1856.

The 1844 instructions also state the following with regard to obtaining the wet bulb temperature:

“The most easy method of finding this (wet bulb temperature) is to wet the bulb of a Thermometer covered round with fine gauze, and swing the instrument in the open air, in the shade, until the mercury sinks as low as it will.”

“The current of air upon the wet-bulb should be kept up (by swinging) as long as the mercury continues to descend in the tube of the instrument, and for a few minutes after it becomes stationary, in order to ensure the full effect of the evaporation and the lowest degree to which the mercury can be forced to descend by this process, will constitute the observation required...”

NOTE – No mention is made of the hygrometer or wet-bulb temperature in the 1850 instructions from the Surgeon General since the wet bulb temperature ceased to be measured on Feb 1, 1850. Wet-bulb temperatures began to be measured again in the Army Medical Department on Jan 3, 1856 and the 1856 instructions contained the following:

“The hygrometer adopted by this Department consists essentially of a thermometer, the bulb of which is covered with floss silk enclosed in a piece of thin muslin, the ends of the silk sufficiently long to dip into water contained in a brass reservoir secured immediately below the bulb. In the top of this reservoir is a small opening to admit the silk, and to the front is attached a cylinder communicating with the interior by a small hole. The reservoir is to be kept always supplied with water poured into it through the cylinder, and the bulb will be constantly moistened by capillary absorption.”

## Barometer

With regard to the barometer, the 1844 instructions from the Army Surgeon General indicated the following:

“The instrument adopted by the Department is the siphon Barometer of Bunten. ... The Barometer will be suspended perpendicularly in a good light, in an apartment having an equable temperature, and a dry atmosphere.”

“When once suitably placed, the position of the instrument should not be changed, unless from absolute necessity – in which case the circumstances will be carefully noted on the Register, under the head of ‘Remarks.’”

NOTE – This instruction did not appear to be followed at Fort Washita when the surgeons moved to the new hospital, unless the barometer was located at a separate location and was not moved - an unlikely scenario.

NOTE – Instructions in 1856 stated, “The barometer now in use by the Department are the siphon, of Bunten, and the cistern, of Green.” No other changes are documented with respect to the barometer from instructions in 1844 through the instructions in 1856.

NOTE – Based on recorded temperatures of the attached thermometer, as well as instructions from the Surgeon General’s Office, it appears the barometer at Fort Washita was not located in a working or living space. A clerk at the Post Hospital at Carlisle Barracks, PA in 1867 indicated the barometer was located in an outside kiosk along with the thermometers. Recordings from the attached thermometer during the winter months at Fort Washita are too warm to be located in an un-heated outside building, but are also too cold to be located in a heater inside room.

## Wind Instruments

Available documents suggest that no wind instruments were available to Army field surgeons prior to the 1860s. Instructions from the Surgeon General’s Office in 1844, 1850, and 1856 provided guidelines for subjective observations. Wind directions were to be expressed by the points of a compass, as done by observing the general direction from which the wind was blowing, and wind force was to be expressed by a subjective scale ranging from 0 to 10 (e.g., “A gentle breeze” for a scale value of “2,” “A brisk breeze” for a scale value of “4,” and a scale of “6” for “A very strong wind”). These guidelines appeared to have remained in effect until around the 1860s.

## Special Observations

The following was listed in the Army Surgeon General instructions in 1844 with regard to taking special weather observations:

“Hourly Observations of the Barometer will be taken for 24 hours, at the equinoxes and solstices, to correspond with those already instituted at numerous points of Europe and America, at the suggestion of Sir John Herschel. The days fixed upon for these observations are the 21<sup>st</sup> of March, June, September, and December. But should any one of these 21<sup>st</sup> days fall on Sunday, then the observations will be deferred till the next day, the 22<sup>nd</sup>.”

“The observations at each station will commence at 6 o’clock, A.M. of the appointed days, and be continued at the beginning of each hour till 6 A.M. of the following days, care being taken to obtain the correct time.”

“The exact maximum and minimum of temperature of the 24 hours should be recorded, under the head of ‘Remarks,’ at the precise hour and minute at which they occur.”

The value of these hourly observations will be greatly enhanced, if they be extended to all the objects embraced in the daily Register. If there be a storm about those times, hourly observations of all the phenomena, from the beginning to the end of the storm, will also be valuable.”

“All special observations will be recorded separately.”

“Connected with meteorology are many interesting subjects of inquiry, which can only be elucidated by wide-spread, simultaneous observations. The Medical Officers of the Army are therefore confidently invited to co-operate in the collection of data tending to advance the interests of science. For the accuracy of our observations, (quoted as they will be both at home and abroad,) it is hardly necessary to say, the reputation of the Department is pledged.”

NOTE – The instructions in 1850 contained the same information as depicted in 1844 regarding special observations. However, no mention is made of special observations in the 1856 instructions, indicating this requirement was dropped.

### Routine Observations

The first observation available in the National Climate Data Center (NCDC) database for Fort Washita, OK was on Jul 12, 1842. A note on the Jul 1842 form states, “Thermometer was not received until the 12<sup>th</sup> July.” The observing record is continuous until Feb 1858 when the fort was ordered to be abandoned by the War Department through Dec 1858. Observations commenced Jan 1, 1859 and continued intermittently through Mar 1861 when the post was abandoned permanently by Federal forces. Observational gaps occurred from Jun 1859 through Oct 1859, and another gap from Apr 1860 through Sep 1860.

Initial observations from Fort Washita in 1842 indicate the temperature was measured (degrees Fahrenheit) and recorded four times daily: sunrise, 3 PM, sunset, and 9 PM

(NOTE – Observation times used by the Army surgeons refer to local times, as compared to Signal Service observations which were based on Washington DC time). Wind direction and sky condition (recorded as clear or cloudy) were recorded for “AM” and “PM.” (NOTE – Times for weather observations during the early and mid 1800s frequently were recorded as “sunrise,” “sunset,” “AM,” or “PM.” Whereas times for sunrise and sunset can be determined relatively accurately, the times “AM” and “PM” are nebulous. Unfortunately, no information could be found to define the times for these observations.). Significant weather was recorded in the Remarks section of the observational forms. Figure 8 shows an observation form for Fort Washita for this early observing period.

**DIARY OF THE WEATHER** at *Fort Washita, Ok.*  
 for the quarter ending the *10th* day of *October* 184*2*  
 Latitude \_\_\_\_\_ Longitude **23** **199**

MONTH.	THERMOMETER.					BAROMETER.	WINDS.		WEATHER.		RAIN. INCHES.	REMARKS.
	SUN RISE.	3 P. M.	SUN SET.	9 P. M.	MEAN.		SOON.	A. M. P. M.	A. M. P. M.			
<i>October</i> 1st	<i>49</i>	<i>0</i>	<i>72</i>	<i>11</i>	<i>71</i>		<i>S. E.</i>	<i>W. S. W.</i>	<i>Clear</i>			
2d	<i>52</i>	<i>12</i>	<i>72</i>	<i>11</i>	<i>68</i>				<i>W. S. W.</i>			
3d	<i>55</i>	<i>12</i>	<i>74</i>	<i>11</i>	<i>71</i>				<i>W. S. W.</i>			
4th	<i>62</i>	<i>18</i>	<i>74</i>	<i>70</i>	<i>73</i>				<i>W. S. W.</i>			
5th	<i>59</i>	<i>15</i>	<i>75</i>	<i>70</i>	<i>72</i>				<i>W. S. W.</i>			
6th	<i>57</i>	<i>14</i>	<i>74</i>	<i>70</i>	<i>68</i>				<i>W. S. W.</i>			
7th	<i>61</i>	<i>16</i>	<i>76</i>	<i>72</i>	<i>71</i>				<i>W. S. W.</i>			<i>Thunder &amp; lightning with rain</i>
8th	<i>57</i>	<i>14</i>	<i>75</i>	<i>70</i>	<i>68</i>				<i>W. S. W.</i>			
9th	<i>54</i>	<i>11</i>	<i>74</i>	<i>70</i>	<i>67</i>				<i>W. S. W.</i>			
10th	<i>56</i>	<i>13</i>	<i>72</i>	<i>70</i>	<i>64</i>				<i>W. S. W.</i>			
11th	<i>57</i>	<i>14</i>	<i>72</i>	<i>70</i>	<i>68</i>				<i>W. S. W.</i>			

Figure 8. October 1842 “Diary of the Weather” recorded at Fort Washita, OK.

On Jan 1, 1843, changes occurred in the Army Medical Department weather observation program that continued into the 1850s. These changes were reflected at Fort Washita. Temperature measurements were made four times daily at: “Sunrise,” “9 AM,” “3 PM,” and “9 PM.” According to the Annual Report of the Surgeon General, these times were selected to correspond with the observational times adopted by the Royal Society of London, with the exception that Army surgeons took the observations a “little before sunrise” versus the 3 AM observation recommended by the society.

The following indicates the parameters measured/observed at Fort Washita beginning in Jan 1843:

1. Temperature measurement – Four times daily (degrees Fahrenheit)
2. Clearness of the sky – Four times daily (the amount of clear sky at the hour of observation expressed from “0” to “10,” with “0” indicating no clear sky and “10” indicating no clouds)
3. Wind direction and force – Four times daily (direction expressed on an eight-point compass and wind force expressed on a scale from “0” for calm conditions, to “10” for a “violent hurricane”; e.g., SW4)
4. Clouds – Four times daily (direction from which the clouds were moving (eight-point compass) and cloud movement expressed on the same scale used for the force of the surface wind, i.e., “0” for no movement to “10” for movement corresponding to a “violent hurricane,” e.g., NE2 or SE1)
5. Wet bulb temperature – At sunrise and 3 PM (degrees Fahrenheit)
6. Daily rainfall – Beginning, ending, and amount
7. Significant weather in Remarks section

Although rainfall measurements were started Jan 17, 1843, only rainfall intensity was recorded initially at Fort Washita with rainfall amounts beginning Aug 1843.

Latitude/Longitude coordinates were first listed on the Mar 1843 observational form: Latitude 34°0' N., Longitude 19°20' W. (Longitude refers to degrees Longitude west of Washington DC). In Oct 1849 the Latitude was expanded to 34°14'26"N with no change in Longitude. The first mention of elevation occurred with the installation of the barometer-May 1847-with the following note: “Altitude of Fort Washita Bar. Above Bed of Washita River 330 feet.” In Oct 1849 the listed elevation on the observation form was changed to 645 feet above sea level. NOTE - GPS coordinates for this site are 34°6'6"N 96°32'47"W with an elevation of 725 feet. Based on topographical maps, the Fort Washita Hospital was approximately 100 feet above the bed of the Washita River.

Barometric readings were made and recorded (inches of mercury), beginning May 1, 1847. With the addition of barometric readings, Fort Washita Army surgeons were taking all observations indicated on the Meteorological Register Form (observational form used by Army surgeons). Beginning May 1, 1847, the following were being measured/observed by the Fort Washita Army surgeons at sunrise, 9 AM, 3 PM, and 9 PM:

1. Barometric measurements
2. Temperature measurements (from attached and detached thermometers)
3. “Clearness of the Sky” observations
4. Wind direction and force observations

In addition, the wet bulb temperature was measured at sunrise and 3 PM, and daily rainfall measured, along with beginning and ending times. Significant weather was

included in the Remarks section. On Feb 1, 1850, the wet bulb temperature ceased to be recorded on the observation forms, and on May 1, 1851, the Army surgeons began using a new form with wet bulb temperatures deleted on the official form, i.e., stopped by the Army Surgeon General's Office.

On Oct 24, 1850, temperatures from the attached thermometer were no longer recorded on the observational form. The section on the form labeled "Thermometer Attached" continued to be left blank until Mar 1, 1857 when temperatures from the attached thermometer were again recorded, and continued until observations ceased on Mar 31, 1861.

Significant observational changes occurred on Aug 1 1855. Observations were taken three times daily at the following times: 7 AM, 2 PM, and 9 PM. The following parameters were measured/observed:

1. Barometric pressure
2. Temperature (detached thermometer)
3. Wind direction and force
4. Sky condition (only the terms "fair" or "cloudy" were recorded)

The beginning, end, and rainfall amount for each day continued to be recorded, as well as significant weather in the Remarks section.

On Jan 3, 1856, the surgeons again began measuring wet bulb temperatures for the three observation times.

The last observations for Fort Washita in the NCDC database are for Mar 31, 1861. At that time, observations continued to be taken at 7 AM, 2 PM, and 9 PM for the following parameters:

1. Barometric pressure
2. Temperature (attached and detached thermometers)
3. Wet bulb temperature
4. Wind direction and force
5. Sky condition

Daily rainfall amounts were recorded along with the beginning and ending times and significant weather was recorded in the Remarks section.

### **Acknowledgments**

The staff of the government documents section of the Oklahoma State University Library was extremely helpful and generous in sharing their information. Their help was essential in locating critical documents published by the Army Surgeon General's Office in the mid 1800s.

Steve Doty developed the procedures and methodologies used in developing this report. Without the extensive work of Steve in developing the appropriate process, this research would not have been possible.

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### Data Sources

Data regarding weather instrument location and exposure at Fort Washita for this period, i.e., observations by the Army surgeons, is sparse to non-existent. The NCDC database was the primary source of weather observations by the surgeons at Fort Washita from 1842 into early 1861, but no information was available on instrument location, exposure, or type of instruments used at this location. In addition, the surgeons themselves appeared to take meticulous weather observations, but did not include any information on the forms with respect to the instruments.

Primary information regarding weather instruments used by the Army surgeons and procedures used to take the observations came from publications by the Army Surgeon General's Office (1844, 1850, 1851, 1856, and 1868) which provided instructions to be used by field surgeons.

Annual reports by the U.S. Army Surgeon General were reviewed for the years 1825 through 1875 with only bits and pieces of revealed information. The primary exception was the annual report for 1844 which contained a summary of instructions for taking weather observations; however, a more detailed document was obtained from the National Library of Medicine in Bethesda, MD. Several publications by the Army Surgeon General were obtained from the extensive government library microfiche collection at Oklahoma State University.

Some information was obtained on Fort Washita from the Oklahoma Historical Society and the Oklahoma University Western Historical Collection, primarily a map and a few publications. Considerable help was provided by the resident expert at the Fort Washita Historical Site, primarily regarding the location of the two hospitals and transfer of medical operations to the new hospital. Other possible sources of information checked include the Durant Public Library and the Southeastern Oklahoma State University Library (Durant, OK).