

HISTORY OF WEATHER OBSERVATIONS
Fort Ripley, Minnesota
1849 - 1990



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On the front cover is the abandoned hospital building and Officer's quarters at Fort Ripley circa 1906. From the Minnesota Historical Society.

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HISTORY OF WEATHER OBSERVATIONS

Fort Ripley, Minnesota

1849 – 1990

INTRODUCTION

Goal of the Study

The goal of this study is to document the site and instrumentation of old Fort Ripley. This period begins when the fort is under construction in 1849 and ends when the fort is abandoned in 1877. Monitoring sites near the city of Fort Ripley after 1877 will be part of an appendix at the end of the report. Existing meteorological forms and historical documents will be studied and a site visit to the current Ft. Ripley site will be preformed.

Historical Overview

The old site of Fort Ripley is entirely located within the large Camp Ripley Military Reservation in Morrison County. (Figures 1 & 2.) Old Fort Ripley was adjacent to the shore of the Mississippi River. In the years before the site was surveyed in 1848, the old growth pine forest in the vicinity was logged. A series of forest fires swept though the area in the slash that was left behind. By 1848, There were scattered areas of second growth pine, oak and birch remaining to the west of the Mississippi River and a landscape of an oak savanna to the east of the Mississippi River. The immediate terrain surrounding the fort is generally flat with some hills to the west and a sloped bank to the Mississippi. The fort was about 20 feet above the Mississippi River. Opposite the fort on the east side of the Mississippi River was the farm of Baldwin Olmstead. The gardens for the fort were established to the south of the post in short order after completion. Prairie fires were a common spring and autumn event.

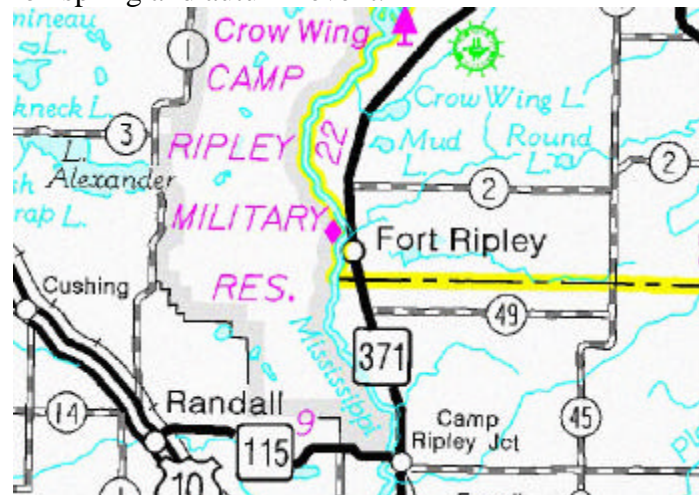


Figure 1. Minnesota Department of Transportation road map showing the location of Camp Ripley Military Reservation. The ruins of old Fort Ripley are at the diamond in the center of the image. North is at the top of the page and the east-west distance across the map is 25 miles/40km.

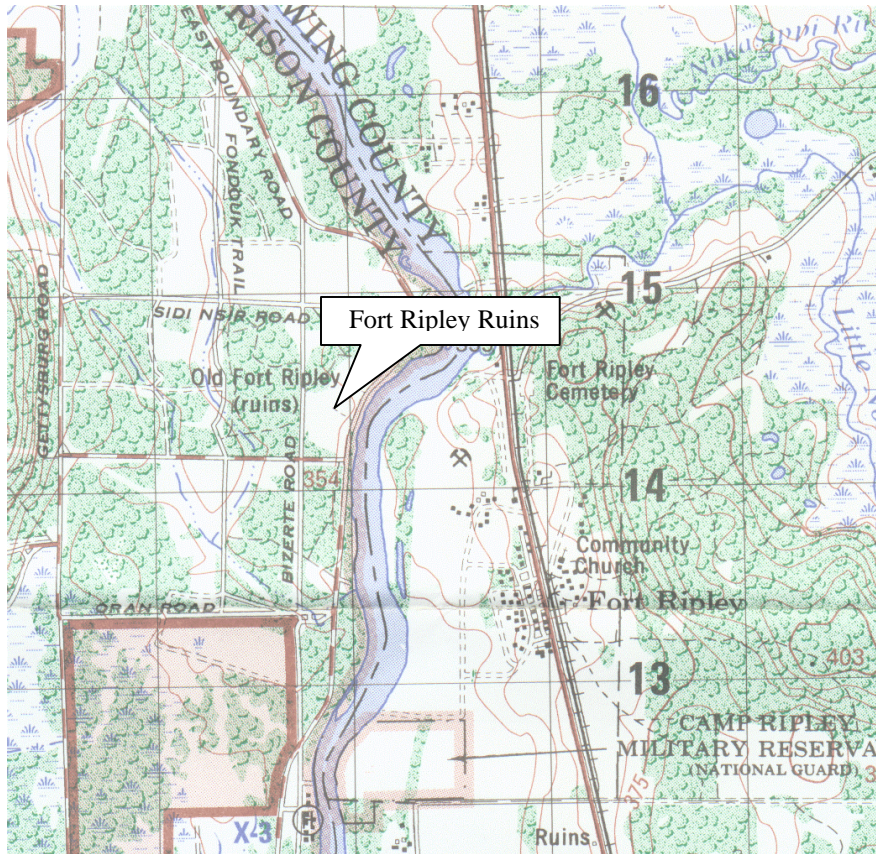


Figure 2. Special topographical map of the modern Fort Ripley area with the old fort site listed as: “Old Fort Ripley (ruins)” in the middle left part of the page. North is at the top of the map and the east-west distance across the map is 2.8 mi/4.5km.

A detailed description of the fort was presented in the book: **War Department Circular No. 4 A Report on Barracks and Hospitals with descriptions of Military Posts from 1870:** "Fort Ripley is situated in latitude $46^{\circ} 10' 30''$ north, longitude $94^{\circ} 18' 45''$ west upon the west bank of the Mississippi, elevated 20 feet above that river, and probably 1,100 feet above the Gulf of Mexico... (Actual location was latitude $46^{\circ} 10' 52''$ north, longitude $94^{\circ} 22' 41''$ was 354m or 1161 feet.) The little river Nokay (Nokasippi River) empties into the Mississippi from the east, at about 300 yards north of this point. The post is built upon a sandy plateau, partially drained by shallow ravines at its northern and southern extremities, gradually sloping toward a narrow swamp about a half-mile in rear of the fort. Beyond this is a range of thickly wooded hills, rising to a height of 100 or 150 feet, which slightly shelter the post from the northwest winds of winter. To the westward of these hills again is a belt of broken surface thickly covered with woods and swamps. Above and below the fort the river is skirted by a narrow belt of swampy land, usually partially inundated in spring, supporting the growth of linden or basswood elms, maple, birch, with pine and poplar on the higher grounds, and a luxuriant undergrowth of shrubs, constitute the sylvia of the immediate neighborhood.

On the east side of the Mississippi (here about 180 yards wide) a gently undulating, sandy and barren prairie, from a few hundred yards to a three miles wide,

extends from the mouth of the Nokay to the southward, bordered by a growth of oaks and pines along the river, and by a range of low hills, partially covered by oaks, on the west. Opposite to the post this strip of land is less sterile than the rest, which has been for several years under cultivation, and part of which is liable to overflow in the spring. See Figure 3.

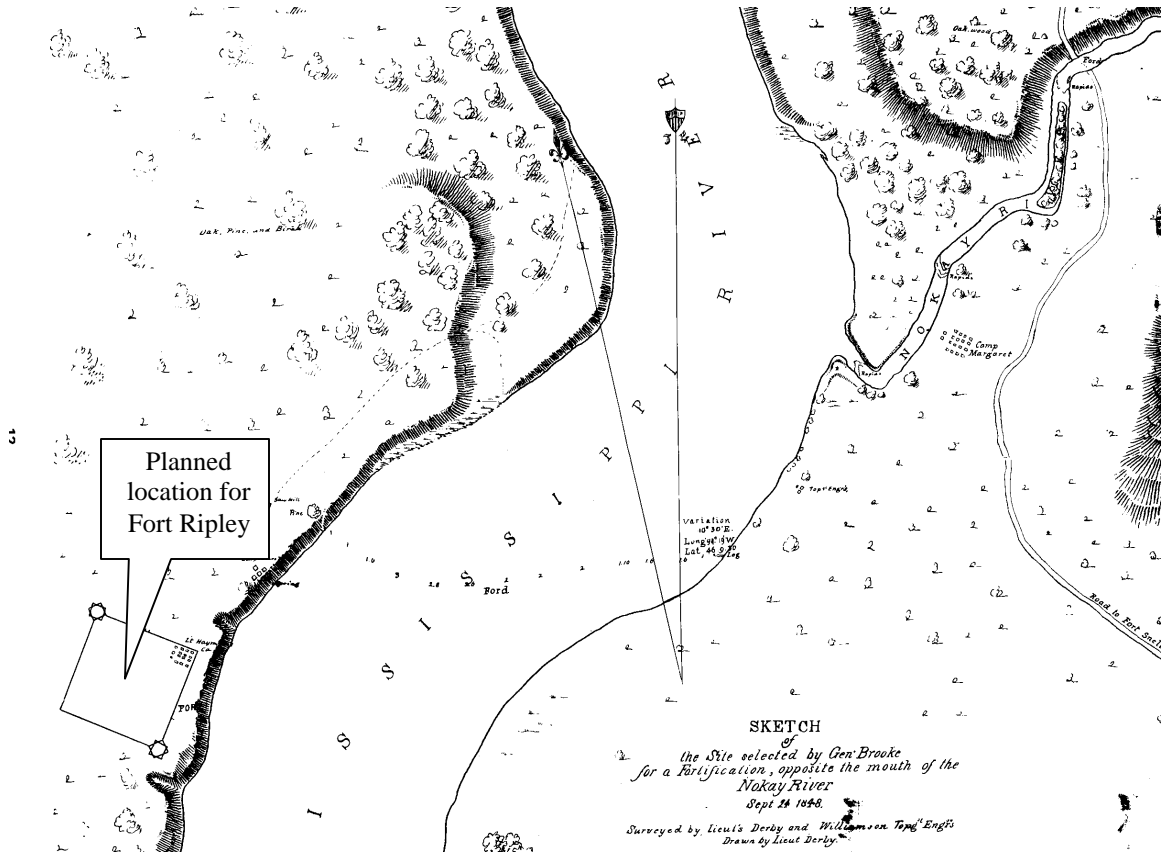


Figure 3. Map drawn of the proposed site for Fort Ripley on September 24, 1848. From: The Muster Roll, a biography of Fort Ripley Minnesota. North is at the top and the east-west distance is .62mi/1km.

Fort Ripley was constructed to keep the peace in the area with the newly arrived Winnebago Indians and the simmering conflict between the Ojibwa (Chippewa) and Dakota (Sioux) Indians. The Winnebago were placed on a reservation centered near Long Prairie in August 1848. The fort was built on the west side of the Mississippi River to be on the same ground as the new Winnebago Reservation. This location was somewhat unfortunate since the main road from St. Paul to Pembina was on the east side of the river. A ferry had to be used to cross the river sometimes with tragic consequences.

Construction began in November 1848. Work over the winter of 1848-49 was to gather the timber necessary for the fort to be raised the summer of 1849. The original name for the fort was “Fort Marcy” after the William L. Marcy, Secretary of War from 1845-1849. This nomenclature didn’t last long and the fort was renamed “Ft. Gaines” in 1849 after General Edmund Pendleton Gaines. Gaines lent a hand constructing a fort in Alabama, which in turn was named after him. So a new name had to be chosen for the

Minnesota fort. The final name chosen in 1850 was Ft. Ripley after Brigadier General Eleazar W. Ripley, a hero from the war of 1812.

The fort was composed of one-story wood frame buildings forming three sides of a square, the fourth side being the Mississippi River. The officer's quarters, the barracks and hospital were filled in with brick. Between the buildings of the fort there were gaps between ten and twenty-five feet. There was not a picket or wall around the fort for the first fourteen years of its operation. There would not be a picket enclosure around the fort until the fall of 1862. On May 13, 1849 the posts' first garrison arrived from Ft. Snelling. The construction of the fort was complete in April 1851. In general, Fort Ripley was considered a fairly healthy fort with no major outbreaks of disease in the garrison.

The site was quite isolated and a good distance from any centers of habitation. The immediate neighborhood was the Winnebago and Ojibwa, a few scattered farmsteads, and the pesky whisky sellers at Crow Wing about seven miles to the north. The closest town of any size was Little Falls, fifteen miles to the south. The main supply depot for Fort Ripley was Fort Snelling.

The winters could be long and cold in central Minnesota. The Winnebagos longed to leave because of the cold and the relatively poor land they were relocated to. The federal government removed the Winnebagos to a new reservation in the vicinity of Mankato in 1855. During this time settlers squatted on reservation land near the fort. In 1857 the US Army, feeling that Ft. Ripley had outlived its service, withdrew the garrison. The fort was officially abandoned on July 8, 1857. A few people like the post's Rev Chaplain Manney stayed behind. With the fort closed, lawlessness began to break out with traders illegally selling liquor to the Ojibwa. Minnesota's first lynching of three Ojibwa men in custody on a suspected murder charge brought a hasty return of a garrison to the post. Ft. Ripley reopened on September 12, 1857.

With the Civil War in April 1861, Army regulars left the post and Minnesota volunteer regiments replaced them. The fear of a direct Ojibwa assault on the fort was the greatest in August 1862, coinciding with the Dakota uprising. Panicked settlers flocked to the fort and tensions were high until the threat of attack ceased. There was never a direct assault on Fort Ripley. Following the Dakota uprising, the fort became a staging ground for the "Indian War" campaigns in the Dakotas.

The main threat to the fort over the years wasn't an impending Indian attack; it was the roaring fires necessary to fend off the winter's chill. Several fires destroyed buildings during the course of the fort's life. Even in the summer the threat of fire was present. At about midnight July 20, 1870 a fire broke out in the hospital kitchen. In short order the hospital, the chapel and the Adjutant's, Quartermaster and Commissary Offices were burned to the ground. All the post surgeon's personal surgical instruments were destroyed; even clothing belonging to the hospital steward was burned in the fire. The hospital was rebuilt that winter on the same site. It was built rather hastily and the freshly sawed boards used for the hospital shrunk over the next few years with drafty results (Figure 4.)

In the 1870's there were signs that the life of Fort Ripley was drawing to a close. By 1873 the western frontier was now 500 miles west of Fort Ripley. Even though the Ojibwa didn't take place in the 1862 outbreak, nervous settlers in the area demanded their removal. Eventually, the Ojibwa were moved north outside the Fort Ripley region and eliminated one of the purposes for a fort in the area. A devastating fire during the night of

January 14 1877 on the north side of the fort complex destroyed the officer's quarters, the laundresses' quarters, and storehouse. Rather than rebuild, and with the post no longer being in the "frontier" Fort Ripley was closed on July 11, 1877. A caretaker was left behind to watch the buildings, and the garrison was removed.

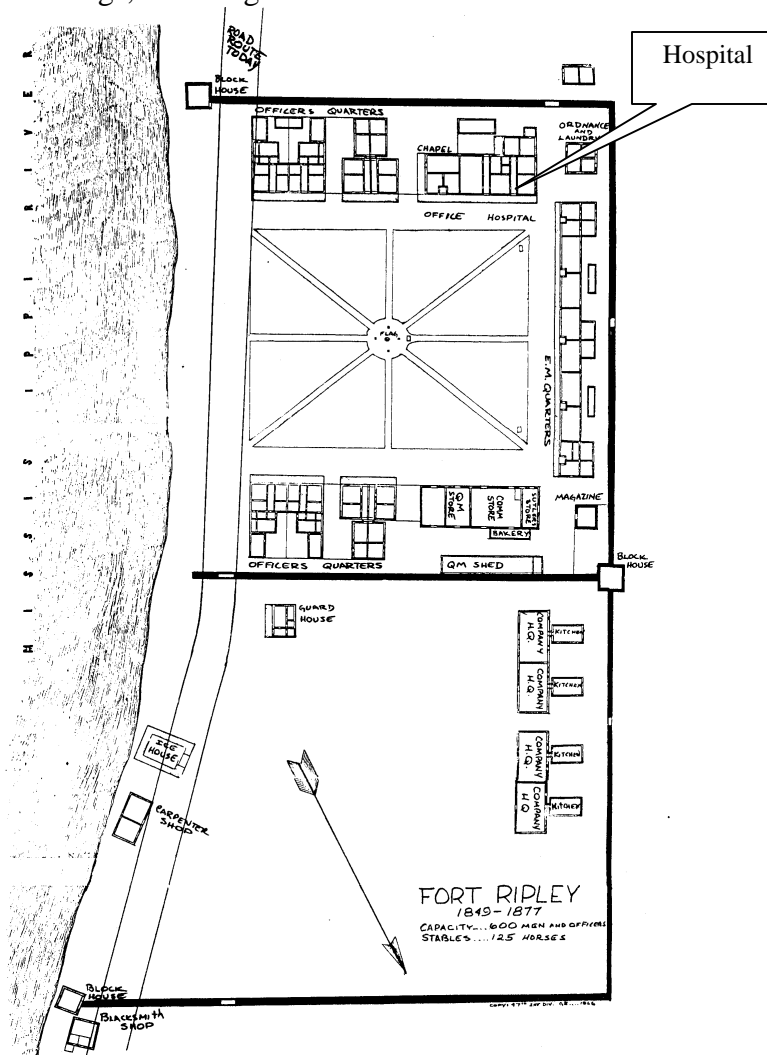


Figure 4. This is how Fort Ripley looked after the hospital was rebuilt after the 1870 fire. From a sketch drawn from the 47th Infantry Division, 1946. From the Minnesota Military Museum. North is at the bottom of the map in this case. The east-west distance across the map is 500feet/152m.

HISTORY OF WEATHER OBSERVATIONS

The era of systematic weather observing began with the Surgeon Generals Office at the U.S. Army in 1819 by Surgeon General Joseph Lovell. The belief was that a soldier's health depended on the climate. Knowing what to expect in a given area would be beneficial. Since the observing network began, various improvements were made in the years leading up to when Fort Ripley was established. One of the largest changes being four time daily observations at sunrise, 9 am, 3 pm and 9 pm. Fort Snelling was the

first of the fort sites established in Minnesota in 1819 with Fort Ripley the second in 1849.

OBSERVERS

Similarly to Fort Snelling, Fort Ripley had many surgical personnel pass through the doors of its hospital during the 28 years of operation. Under orders of the Surgeon General, the surgeon at each post was responsible for keeping a weather log. In the Fort Ripley Meteorological Register, the records are for the most part, well kept and are filled with many interesting remarks. Clearly the people involved had more than a passing interest in their natural environment.

It is highly likely that the routine day-to-day weather observations were relegated to a hospital steward or orderly, with the senior staff signing the forms. In the document **Meteorological Register for Twelve Years From 1831 to 1842 Inclusive Compiled from Observations made by the Officers of the Medical Department at the Army at the Military Posts of the United States** the following is noted: “It is impossible for the Medical Officer to be at all times present to take the observations himself; hence the duty devolves in some measure upon the hospital steward, who though selected for his general intelligence, may not be so observant of the prescribed rules, nor feel the necessity of extreme accuracy in taking Meteorological Observations, as might be desired.” In that mouthful of a sentence, one must wonder just how often the stewards were the actual observers, indeed with just a casual glance at the Fort Ripley record, the stewards had more than a minor role in observation.

The Meteorological Register for Fort Ripley was analyzed for the medical personnel at the post in charge of the observations. The signatures were difficult to read on the meteorological forms. An oversize monthly summary book called: **Voluntary Observers Meteorological Reports by the War Department, Office of the Chief Signal Service Officer**, was useful for crosschecking names. Two volumes of this book are located in the Minnesota State Climatology Office.

Signatures on the Fort Ripley Meteorological Register from 1849 to 1877.

<u>Surgical staff</u>	<u>Months forms were signed</u>
W.J. Frazier, Head Surgeon	7/1849-5/1854
Dr. Jonathan Letterman, Assistant Surgeon	8/1853-4/1854
E. J. Baily Apr. Surgeon	5/1854-6/1857
Post closed from July-October 1857	
Aly B. Hasson Apr. Surgeon	11/1857-9/1858
Rich Potts Acting Surgeon	10/1858-3/1859
T.M. Smith Acting Surgeon	4/1859-8/1859
A. Wall Apr Surgeon	9/1859-3/1861
R Ravenburge Hospital Steward	4/1861-5/1861*
JNS V Wren M.D. Acting Surgeon	6/1861-6/1861

Henry McMahon Acting A. Surgeon	7/1862-11/1862
F. Riger Surgeon	12/1862-3/1863
Henry McMahon Acting A. Surgeon	4/1863-8/1864
J. V. Wren Acting A. Surgeon	9/1864-4/1865
W.H. Bradley	5/1865-6/1865
Wm H Rouse A.A. Surgeon	7/1865-11/1865
December 1865 form is missing.	
Wm H Rouse A.A. Surgeon	1/1866-5/1866
April, June-August 1866 forms are missing.	
E.E. Braun Acting Apprentice Surgeon	9/1866-11/1866
October 1866 form is missing.	
C. T. Alexander Acting Apprentice Surgeon	12/1866-4/1867
E.E. Braun Acting Apprentice Surgeon	5/1867-2/1869
March 1869 to November 1869 forms are missing	
Chas. K. Winnie Assistant Surgeon	12/1869-4/1871
.J. J. De Lamater A.A. Surgeon	5/1872-9/1874
Geo E. Lord A.A. Surgeon	10/1874
James Shair Acting Assistant Surgeon	11/1874-4/1875
John H. Kinsman Assistant Surgeon	5/1875-4/1876
John C. Roser, MD Acting Post Surgeon	5/1876
John H. Kinsman Assistant Surgeon	6/1875-4/1876
T.H. Terry Acting Assistant Surgeon	5/1876-7/1877
Last observation at the fort was at 7am July 11, 1877.	

***Appears to have been the actual observer for much of the fort's early record.**

LOCATION OF OBSERVATIONS

The location of the Fort Ripley was first noted on the July 1859 form with the latitude of 46°9'N. No longitude was mentioned but the observing site was described as "On the Mississippi River opposite mouth of Nokasippi." Both latitude and longitude were offered beginning with the February 1850 form: 46° 9'N and 94°16'W. A more precise location on the June 1850 form was 46°10'30"N 94°18'45"W. A note at the bottom of the form states: "The lat. & longitude given are taken from (name unable to read)'s map and are thought to be more accurate than those on previous registers, which were from maps left here by Lieut. Derby, T. Gay. U.S.A." This was the latitude and longitude that was offered on the rest of the meteorological forms. Actual coordinates with a GPS at the site in October 2005 were 46°10'52"N 94°22'41"W.

Instrumentation notes from the Fort Ripley Meteorological Register.

Meteorological Observations began presumably in close proximity to the post hospital on July 1, 1849 (see Figures 5a & b). The post hospital was located in a collection of frame structures that stretched east to west and was the southwest corner of the fort. The front of the hospital had a porch or veranda and faced north. It is not

known exactly where the instruments were placed in 1849. Only one thermometer was furnished to W.J. Frazier, Head Surgeon. The Surgeon Generals' office supplied Form No. 3 Meteorological Register to transcribe the observations. Four time daily temperature readings were noted at sunrise, 9 am, 3 pm and 9 pm. At these same times also recorded were "clearness of the sky," wind and clouds. Both wind direction and "wind force" were observed. The notation: "No rain gauge at post." was written under the "quantity" section of the form. Times beginning and ending of precipitation was noted. Beginning in August 1849 a four times daily description of clouds began.

1849	Barometer.				Thermometer attached.				Thermometer detached.					Clearness of the Sky.					
	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Daily Mean.	Sun rise.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	A.
July 1									69	80	90	80	77.5		4	3	2		
2									52	80	84	60	68						
3									50	68	75	68	62.5	2	3	5	1		
4									48	70	82	67	65	4	5	8	7		
5									51	68	82	62	66.5	0	0	5	9		
6									53	74	89	66	72	1	0	6	7		
7									52	75	88	75	70	7	8	7	3		
8									62	75	90	65	70	6	1	3	10		

Figure 5a. This is the first observing form for Fort Ripley when records began in July 1849. Only the top left part of the form is shown to improve readability. From the Forts Database CD ROM, Midwestern Regional Climate Center and the National Climatic Data Center.

Wind.		Clouds.				Wet Bulb.		Rain.			REMARKS.
9 M.	3 P.M.	9 M.	9 A.M.	3 P.M.	9 P.M.	Sun rise.	3 P.M.	Began	Ended	Quantity.	

Figure 5b. This is the same observing form for Fort Ripley from July 1849. Only the top right part of the form is shown to improve readability. From the Forts Database CD ROM, Midwestern Regional Climate Center and the National Climatic Data Center.

remarks of Mr. Ravenbuge are interesting that he was the one performing the observations, which confirms that the hospital stewards definitely had a role. On the same form that Mr. Ravenbuge makes his comments, TM Smith Acting Surgeon, signs the form at the bottom.

With the cold weather of winter approaching in November, 1859 this note is listed under remarks: "November 8, No water is kept in the reservoir of the Hygrometer from this day. The bulb is moistened 15 minutes before each observation." It's impossible to tell what kind of shelter if any the thermometers were in. On the July 1861 form under July 25th: "Thermometer, Hygrometer exposed to the sun at 12:30 pm." This was the only comment this month so its possible that this was only temporary. There is an unexplained gap in the register from May 27 1865 to June 6th 1865 with a simple note saying, "No register was kept."

In December 1869 (Figure 7), a new form appears and has: Self registering thermometer with max and min, three time daily movements of the atmosphere (7 am, 2 pm, 7 pm), amount of cloudiness 7 am 2 pm and 9 pm and quantity of precipitation.

Date	THERMOMETER				MOVEMENTS OF ATMOSPHERE						AMOUNT OF CLOUDINESS			RAINFALL			REMARKS	
	T. & M.	T. & M.	T. & M.	T. & M.	7 A.M.	2 P.M.	7 P.M.	7 A.M.	2 P.M.	7 P.M.	7 A.M.	2 P.M.	7 P.M.	Rain	Total	Quantity		
1																		
2																		
3																		
4																		
5																		
6																		
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Figure 7. Observation form at Fort Ripley for December 1869. Only the top part of the form is shown to improve readability. From the Forts Database CD ROM, Midwestern Regional Climate Center and the National Climatic Data Center.

There is a note on the December 1869 form that says: "No observations made with standard thermometer" under the three time daily section. However, three time daily temperature readings at 7 am, 2 pm and 9 pm begin again in February 1870. Beginning in September 1872 an aneroid barometer was added and readings were taken three times a day at 7am, 2pm and 9 pm. There is a scribble at the bottom of the September form that mentions "aneroid barometer." An interesting note from the observer on the October 1872 report said this about the barometric pressure: "These obs are of no scientific value." A later note from the Surgeon's General office Washington D.C. advises the observer to continue recording the atmospheric pressure. Under the

November 1872 another note was written under the barometer table: “Aneroid Instrument (no correction) mean barometer 28.66.”

On the November 1875 form the minimum temperature was deemed unreliable on the 25th and 26,(assumed to be too low when comparing to the three time daily readings) Beginning in December 1875, the max thermometer is no longer used with no reason given. T.H. Terry Acting Assistant Surgeon becomes the last of the signers of the register and his record begins in July 1876.

A curious note was attached to the March 1877 form. Apparently the Surgeon General noted a discrepancy comparing the standard thermometer to the minimum thermometer. On the March 1877 form, under the “Mean” column, there is a note written that says: “Range lists Min(imum thermometer) and Stand(ard thermometer) at 7am.” Looking at the ranges given for March the min thermometer reading was not even close to the 7am reading and looks to be 10 to 30 degrees too cold. These suspiciously cold readings begin in January 1877 and continue to the end of the recording record when the post is abandoned July 11, 1877.

The following note regarding this was sent to Fort Ripley on April 6, 1877.

**Surgeon General’s Office
Washington , DC
April 6, 1877.**

Respectfully returned to A.A. Surgeon T. H. Terry, whose attention is called to the discrepancies existing between the readings of the minimum thermometer and the standard thermometer at 7am and 9pm. The aneroid barometer must be read and recorded to .01 of an inch

**By order of the Surgeon General U.S.A.
J. Woodward,
Surgeon U.S. Army.**

T.H. Terry replied:

April 16, 1877

Respectfully returned. Do not understand what are the discrepancies alluded to unless the interval range between the minimum and standard thermometer is meant.

This range has been a matter of remark at this post. I think the observations here have been carefully taken and recorded and that the report is correct. Here after the aneroid barometer will be read as directed.

**Very Respectfully,
Your obedient servant
T.H. Terry
Acting Assistant Surgeon**

Instrument Types and Exposure

Since many of the forts were active weather observers before the use of photography became widespread, few if any photos or sketches have been found. Instead, remarks about the instruments become very valuable. Listed are instruments used at Fort Ripley and any information found about each.

Wind vane

Wind vanes were furnished to the forts, but few images exist of them. In fact, there are only two instances where a sketch shows the location of wind vanes, Fort Snelling and Fort Ripley. The first glimpse of a meteorological instrument at Ft. Ripley is a weather vane that can plainly be seen in an 1862 ink wash drawing of the fort. This wind vane is located in the vicinity of the hospital (see Figures 8, 9, & 10).

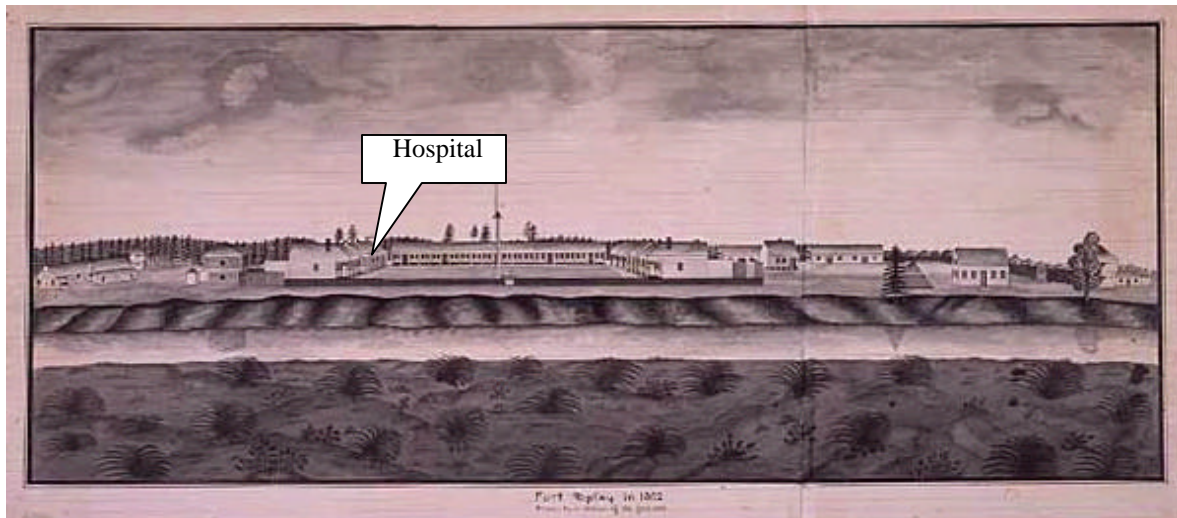


Figure 8. 1862 Ink Wash Drawing of Ft. Ripley. Note open area surround fort and pine stands to west. Flag showing wind direction from the north. From the Minnesota Historical Society

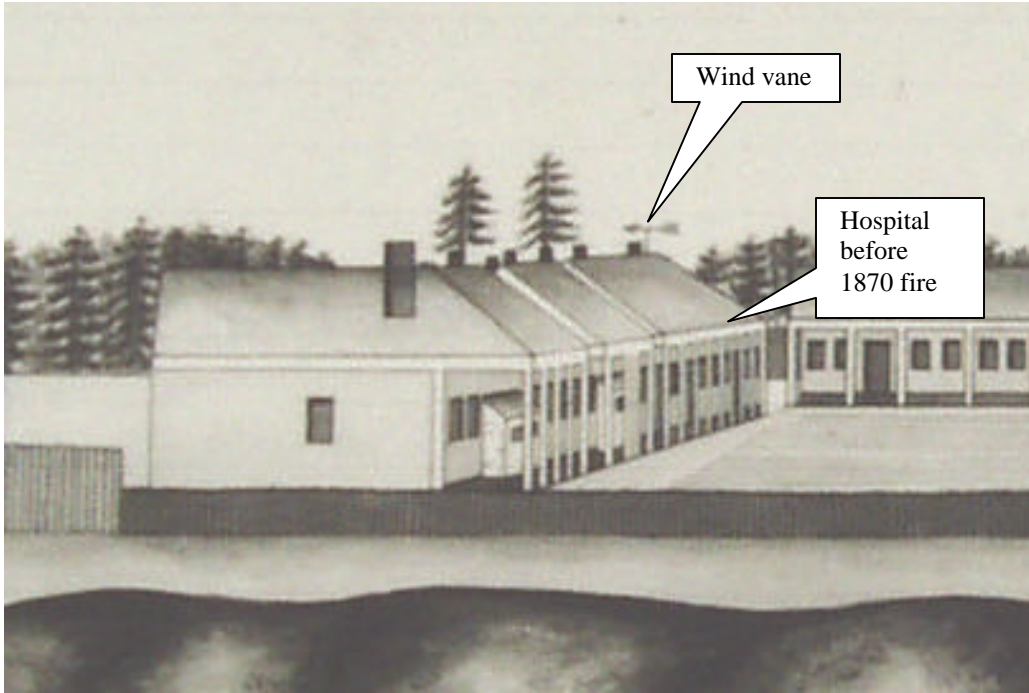


Figure 9. Close up of hospital building (middle right) in 1862 with wind vane poking above the roofline. The wind vane direction matches that of the flag. From the Minnesota Historical Society

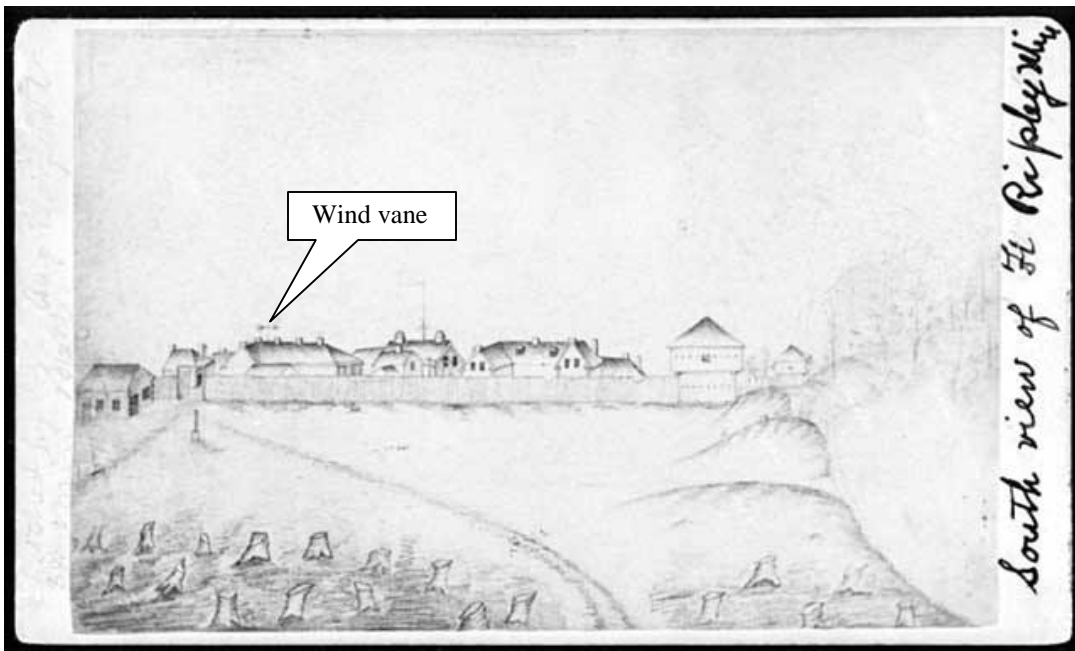


Figure 10. Another view of Ft. Ripley, this time from the south showing the wind vane at middle left (Courtesy Minnesota Historical Society)

Thermometers

When Fort Ripley was commissioned in 1849, Army Surgeon General instructions for thermometers involved a single thermometer read four times a day. These instructions did not change until 1868. On 10 August 1868, the following instructions were issued to Army field surgeons by the Surgeon General's Office regarding thermometer placement:

“The thermometer should be placed in the open air, but under a roof of some kind, and should be well sheltered toward the South. It should be protected not only from the direct rays of the sun, but from the influences of all surfaces which strongly reflect the sun's heat, and of all bodies, such as thick walls, large rocks, etc., which become great reservoirs of heat during the day, and of cold during the night.’

‘...The height which it is deemed best to fix upon is that of four feet from the ground to the thermometer bulb, and the surface under the thermometer should be of short grass, sufficiently exposed to the sun and wind to keep it from habitual dampness.’

‘A thermometer box, in which most of the thermometers observed and recorded at the station are suspended, is generally used for the best conducted meteorological observations, and one should be made and set up at every post where there are means of constructing it. This box, which should be at least two feet square, is preferably made of louver-boards or overlapping slates, but ordinary boards pierced with numerous half-inch holes may be used instead. It should be open at the bottom, and have a roof, which will shed rain. One of the sides should be hinged for convenience of access to the interior, or the box may be left permanently open toward the North, a piece of board or of canvas being used to protect it against driving winds from that quarter. This box is to be well secured on posts, at the proper height from the ground. It should be sheltered from the sun between sunrise and 7 AM, and between 11 AM and 3 PM, special screens being erected for the purpose if necessary. These screens, as well as the box itself, should be whitewashed or painted white.’

Evidence of such a thermometer box can possibly be seen in a striking photograph of Fort Ripley from 1870 (see Figures 11 & 12).

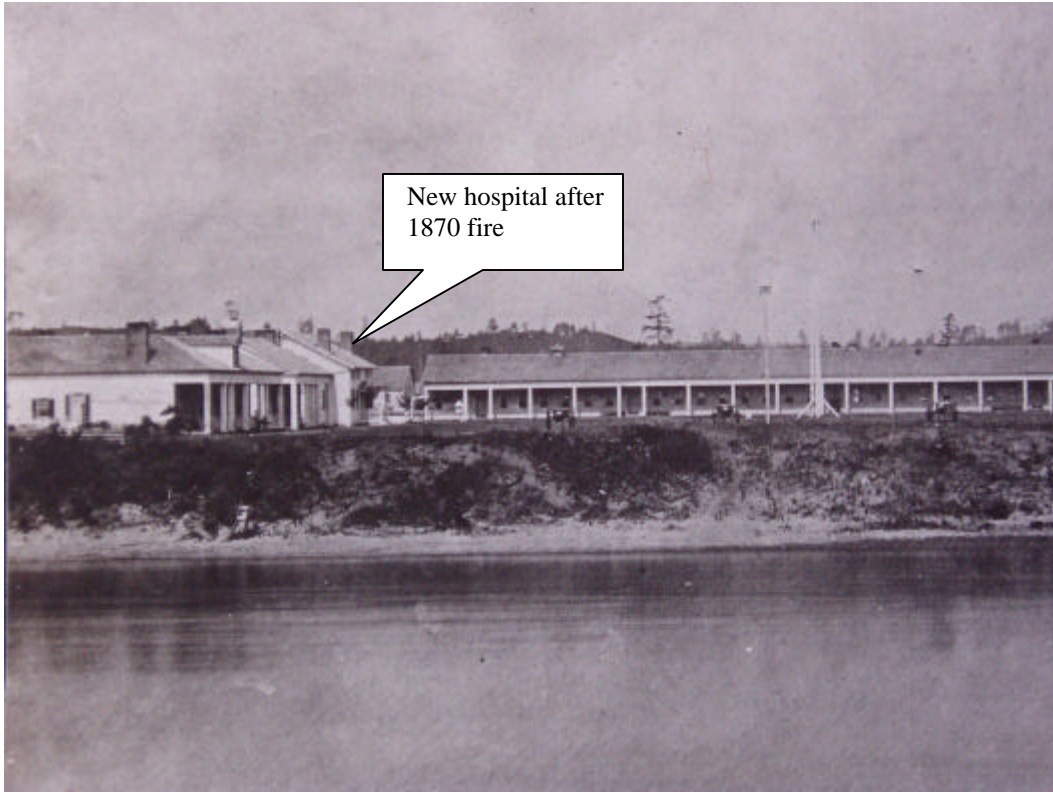


Figure 11. Fort Ripley in 1870, showing the Officer's Quarters front left with the hospital with the double chimneys. From the Minnesota Historical Society

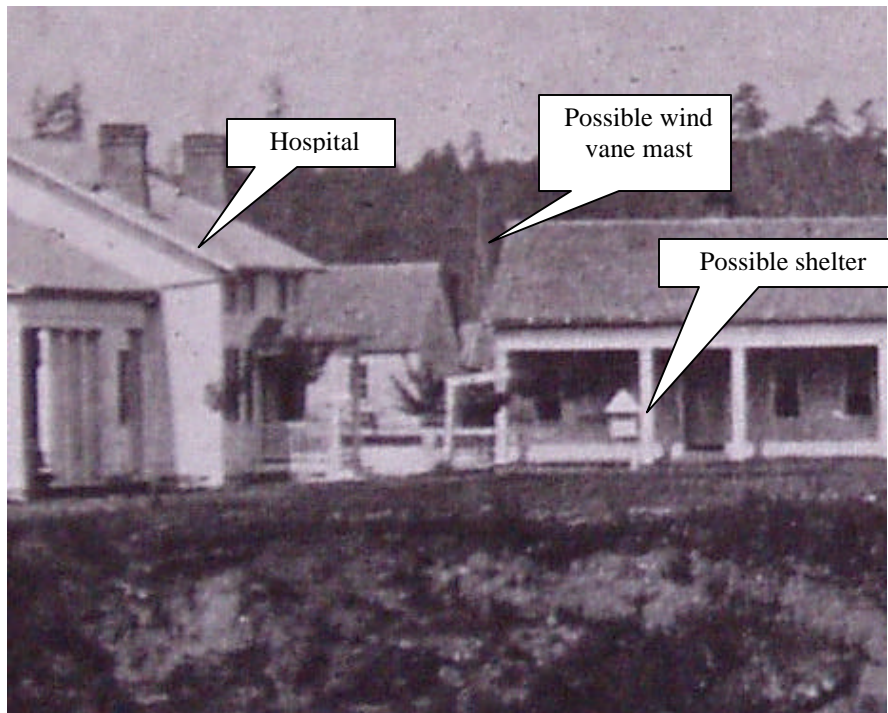


Figure 12. Close up of the hospital (on the left) in 1870 showing a possible instrument shelter and wind vane mast. This view is to the west. From the Minnesota Historical Society

Rain Gauge

Little information can be gleaned about the rain gage used at Ft. Ripley. One was delivered from Fort Snelling in 1849. No description exists about the type of gauge. It was probably a De Witt type of gauge that is mentioned in a book published in 1851 titled: **Meteorological Register: Observations Made by the Officers of the Medical Department of the Army at the Military Posts of the United States.** See Figure 13.

“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:’

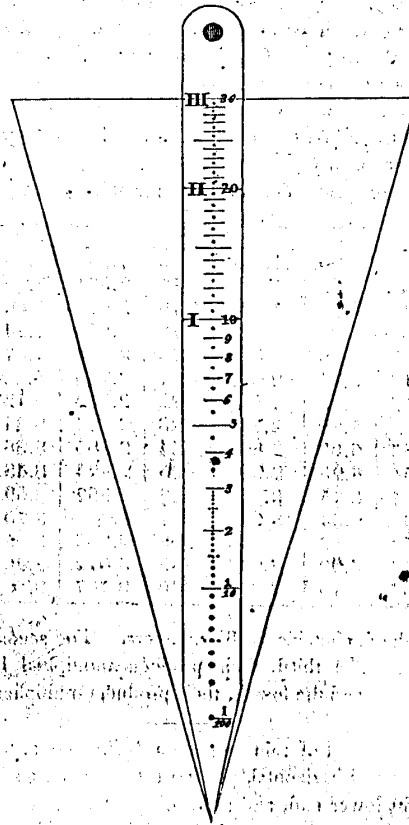
‘The instrument used to measure the quantity of rain which falls, is the conical rain gauge. It will be kept remote from all elevated structures at a distance at least equal to their height, and still further off, where it can be conveniently done. It is to be suspended in a circular opening, made in 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 snowstorm, 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.”

ART. X.—Description of the Nine Inch Conical Rain Gauge; by
S. DEWITT.

Read before the Albany Institute, May 3, 1832.

DeWitt's Nine Inch Conical Rain Gauge, with the Scale represented in it.



Above 3 tenths of an inch, the scale is graduated to half tenths. The intermediate fractions may be measured with sufficient accuracy by the eye.

Figure 13. Sketch of the DeWitt Nine Inch Conical Rain Gauge from: “Stillman’s Journal of the Arts and Sciences”

The old rain gauge instructions were replaced on 10 August 1868, when the Army Surgeon General’s Office advised the following gauge to use:

“The rain gauge now issued by the Department is a brass cylinder seven and a half inches high, and with a diameter at its mouth of one and ninety-seven hundredths (1.97) of an inch; this diameter being fixed upon for the reason that one inch of rain falling through such an aperture will measure exactly fifty cubic centimeters (50 cc), and centimeter graduates are furnished with each gauge for the purpose of making such measurement.’

‘The most desirable place for a rain gauge, other things being equal, is at the surface of the ground, but since it is not easy to protect an instrument in that situation, the gauge will be placed on the top of a post eight feet high,...’

‘For measuring very heavy snow falls, a snow gauge must be used having a mouth of the same size with that of the rain-gauge, but wider at the bottom, so as not to be easily overfilled. The snow which falls in it is to be melted and measured in the centimeter graduate.’

There is mention of the “tin vessel” used to measure snow at Ft. Ripley. For the amusement of the people at the fort, sometimes a charcoal cup of mercury was placed in the snow gauge during extreme cold so people could observe the frozen mercury.

Hygrometer

The first measurement of atmospheric moisture at Fort Ripley was on 4 December 1855. There was a note in the remarks section on 3 December 1855 that stated, “Hygrometer arrived to day.” Fort Ripley acquired a wet-bulb thermometer even though Army Surgeon General stopped measuring wet-bulb (hygrometer) temperatures on 1 February 1850. Below are instructions in 1844 with regard to wet-bulb observations:

“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...”

When wet-bulb temperatures were again measured in the Army Medical Department the Surgeon General instructions for 1856 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.”

As was noted in the Meteorological forms section, the observer at Fort Ripley substituted cotton for the silk wick on September 7, 1859 and found the results to be satisfactory. The 1868 Surgeon General instructions elaborated on taking wet-bulb temperatures:

“An apparatus for swinging a pair of thermometers – a wet and dry bulb – has been constructed at this Office, and will be issued to a certain number of posts for making specially accurate observations. In using this apparatus the covering of the wet bulb is to be moistened with a soft brush before each observation, and the apparatus then whirled round for a few minutes...’

‘When a stationary wet bulb is used it is to be placed in the box with the other thermometers, but far enough from them not to communicate cold to their bulbs. All casings around the lower part of such a thermometer should be removed, and a piece of wick which dips by one end into a receptacle of rain water, should have its other end coiled around the stem and resting on the top of the bulb, in such a way as to keep the muslin covering uniformly and sufficiently wet. If the wick is connected with the lower part of the bulb, the wetting is more apt to be unequal.’

Barometer

Differing from other military posts, Fort Ripley had an aneroid type of barometer. It is unknown where the placement of this barometer was. Many posts had mercury thermometers. The attached thermometer to the barometer would sometimes offer a clue to its location, either indoor or outdoor. In Fort Ripley, this was not the case since a thermometer was not needed to correct the aneroid barometer.

Modern site visit to Fort Ripley



Figure 14.

After the closing of Fort Ripley in 1877 a caretaker was left in charge of the buildings for a number of years. When the caretaker left, the local farmers in the area began to scavenge the siding on the buildings that remained. A prairie fire destroyed several buildings in 1879. Nonetheless, there were still several structures remaining at the site in the early 1900's. With continued scavenging, by 1931 the only building left standing was the old stone magazine. The remnants of this building still stand in 2005. Most of the artifacts displayed at the Minnesota Military Museum are items fished out of the Mississippi River.

To visit the site, an escort is required since it is within the firing range area of the Camp Ripley Military Reservation. Other than the fact that the buildings are no longer there, the site is remarkably undisturbed. The cellars for the former buildings are plainly visible and the site is obviously mowed at least several times a year. The hospital was easy to locate with the aid of markers that pointed out the position of each building. The look of the site is quite desolate and one can imagine being at the fort in the 19th century. The author visited the site on October 27, 2005. All site visit photos are from the author.



Figure 15. Overall view of the parade grounds. View is to the west. The magazine ruins are on the far right. A modern flagpole marks the site of the original one on the parade grounds. The hospital was located far left center by the lone trees.



Figure 16. This is the site of the hospital and chapel. View is to the south. These trees are growing in the depression left by the cellar.



Figure 17. View to the west of the hospital site.



Figure 18. View to the north of the hospital site.



Figure 19. View to the east of the hospital site

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APPENDICES

Appendix 1

Observations after Fort Ripley closed in 1877

After the post closed in 1877 there was a desire to continue observations in some form at Fort Ripley. In August 1887 a river and rainfall station began with C.B. Clouse as the observer. His location was most likely at the new town of Fort Ripley located just across the river. The forms used were (Form No. 180-1887) Beginning in 1894 form 1009 was used. His last observation was on May 31, 1895. There is a gap until the next observations began with J.J. Tucker in June 1906. This new site was a full cooperative station with max/min thermometers, a rain gauge and a river gauge. During the early years some problems were noticed with the minimum thermometer.

Clarence A. Tucker (The son of J.J Tucker took over in May 1914 and continued to November 1918. Then Irving R. Tucker and his mother were the observers beginning in November 1918. A note on the June 14, 1926 inspection reports notes: "Minimum thermometer elevated at the bulb about 40 degrees and there were a number of separations in the alcohol column. The index found near the top. Minimum temperature record not reliable and should not be used. The length of time the thermometer has been out of order could not be determined from the observer. A new shelter and support would be required if records continue long, but the present it is likely the Mother of the Observer, who is the cooperative observer will resign." Apparently Irving Tucker decided to keep the station going for the next 27 years and was the observer until September 1953. However, thermometer measurements ceased on December 31, 1928.

An interesting snapshot of this site can be found in the 1930's receipt file held at the State Climatology Office. It looks like this station had to put up with floods and thieves during its tenure. See Figure 20.

Form No. 4067 L-Mis.		RECEIPT CARD			
Station <u>Fort Ripley</u>		County <u>Crow Wing</u>			
		Date <u>Oct 6, 1934</u>			
The property of the U. S. Weather Bureau listed below was { <u>in my possession</u> } on the date given in <u>good</u> condition. { received }					
Quan.	Equipment	Serial No.	Quan.	Equipment	Serial No.
	Thermometer, maximum		1	Gage, river (last in flood)	
	Thermometer, minimum			(wire-weight)	44-43
	Support, thermometer			installed on	new funnel
1	Gage, rain and snow, 8-in	3694	10236	Aug. 23, 1934	4-4-47
	Shelters, instrument	{ Large } { Small }			
	Support, shelter				
1	Support, box			new 9-15-1936.	
2	Sticks, measuring			funnel stolen 4-30-40	
				replaced by #776	
		(Signature) <u>J. Tucker</u>		Observer.	

Figure 20. U.S Weather Bureau Receipt Card from October 6, 1934 with notes about the rain and river gauge at Fort Ripley from 1934 to 1947. From the Minnesota State Climatology Office Archives.

In September 1953, Gladys B. Nelson became a river and rainfall observer. Her house was located 1.1 miles north of the old Fort Ripley Site on the east side of the river. A standard rain gauge was installed. See Figure 21. Gladys remained the observer until she retired in November 1990. A new precipitation observer was not found, but river gauge readings are still measured in the area using an automated gage.



Figure 21. These four images are part of a series of National Weather Service Cooperative Station photographs in the late 1950's. This is the Fort Ripley Cooperative Site in October 1959 while Gladys B. Nelson was the observer. From the Minnesota State Climatology Office Archives.

Appendix 2

One cannot help in looking through the recorded observations the remarks of unusual weather the hapless medical staff found themselves in when transferred to an outpost such as Fort Ripley. Listed are some of the more interesting remarks found in the Meteorological Register.

On the bottom of the June, 1850 form the following was noted: “Jun 18,1850 Territorial Governor Ramsey reports that about halfway between Ft. Ripley and Ft. Snelling on the Mississippi a severe hail storm occurred in the evening. One or two hailstones picked up were as large as hen’s eggs and he thought he saw one about the size of a musket ball.”

J. Frazier noted an interesting phenomenon of a Minnesota spring on the May 1853 form. “Note, May 31-June 1. Fires still needed for comfort in quarters. Woods (chiefly oak) & prairies just appear to begin generally green. Frazier would put his observations to good use when he published **Medical Topography and Diseases of Fort Ripley** in 1852. Frazier and his family left Fort Ripley via canoe on August 17, 1853.

An infamous meteorological event was noted in the Meteorological Register in July, 1867. Fort Ripley was the closest meteorological site to the great Sauk Center rainstorm of July 17-18th 1867. This flood was witnessed by a surveyor visiting the Sauk Center area and documented the event. Unofficial amounts claimed 36 inches in 36 hours in the Sauk Center area. Fort Ripley was the closest site with a rain gage and 7.50 inches was measured at Fort Ripley in 24 hours. The Mississippi river rose 5 feet in 24 hours. A bridge over the Nokasippi River was washed out. By the 22nd, the river had risen 8 feet 8 inches. It could have been 13 feet 8 inches total. Over the next 19 days the river fell 9.5 feet.

John C. Roser, MD reports a tornado on the May 20, 1876.

Appendix 3

Methodology

The Meteorological register was the primary source for information regarding instrumentation changes at Fort Ripley. These were provided on CD's titled: **Climate Database Modernization Program: Forts Database from Midwestern Regional Climate Center and the National Climatic Data Center**. The Meteorological Register had observation sheets from 1849 to when the fort closed in 1877.

A visit to the Minnesota Military Museum and looking through their archives was very helpful. There was quite a bit of information in their archives regarding the Fort Ripley. There is also a scale model of the old fort in their museum. The staff at the museum also assisted me with research. It was also at the Minnesota Military Museum where I discovered the excellent book by Robert Orr Baker titled: **The Muster Roll: a Biography of Fort Ripley Minnesota**. There were many references in this book and useful maps of the fort. A site visit to the fort itself was beneficial to see what the lay of the land was. Leland P. Smith, the historian at the fort, went above and beyond answering my questions and I am very thankful for his help.

The Minnesota Historical Society Archives proved to be useful. The diary of Rev Solon W. Manney, who was the chaplain of the fort from 1851 to 1859, is in their holdings. Rev Manney recorded the daily happenings of the fort and mentions meteorological events.

The resources of the University of Minnesota libraries were helpful in assistance via inter-library loan to find some of the more rare books in this study. Notably: **“Circular No. 4 Report on Barracks and Hospitals with Descriptions of Military Posts”**

