Sonic Anemometer

Ambient wind conditions were collected for two prescribed burns at Fort Stewart using two sonic anemometers (81000v, R.M. Young Inc.) set up on the upwind of each burn unit (Figure 1). Burn units F8.1 and F8.2 were burned as a single unit on April 14, 2025, burn unit F6.6 was burned on April 16, 2025. For both prescribed burns, sonic anemometers were located outside the burn unit perimeter at the northwest corner and along the western edge (Figure 4). The sonic anemometers were mounted on top of a 9-m tower and were logged at 10 Hz using CR1000x dataloggers (Campbell Scientific).

Figure 1. Sonic anemometers set up on the northwest corner (left) and the western edge (right) of burn unit F6.6 at Fort Stewart in 2025.

Site Description

Fort Stewart is a United States Army post located in the U.S. state of Georgia. The Fort Stewart-Hunter Army Airfield Forestry Branch manages approximately 240,000 acres of upland and flatwood pine forest. Fort Stewart ecosystem includes longleaf pine forests, wetlands, and wiregrass savanna and has an annual prescribed burn goal of 115,000 acres. Prescribed burn experiments were conducted on two burn units within Fort Stewart during the 2025 Fort Stewart FireSense Research Campaign.

Burn Unit F8.1-F8.2

Burn unit F8.1 (948 acres) and F8.2 (937 acres) had a combined total of 1,885 acres with a primary forest type of longleaf pine-wiregrass woodland with pockets of forested wetlands. (Figure 2).

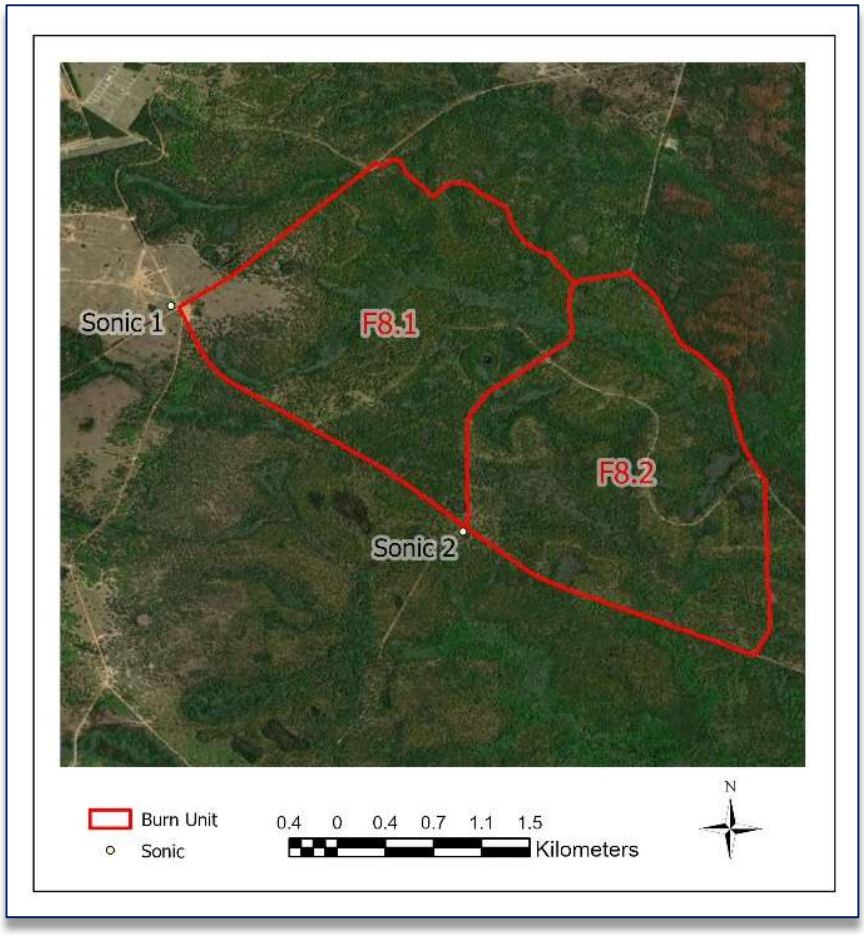

Figure 2. Fort Stewart 2025 burn unit F8.1 and F8.2 with sonic anemometer locations.

Burn Unit F6.6

Burn unit F6.6 consists of 756 acres with a primary forest type of longleaf pine-wiregrass woodland with pockets of forested wetlands (Figure 3).

Figure 3. Fort Stewart 2025 burn unit F6.6 with sonic anemometer locations.

Sonic Anemometer Data

Sonic anemometers (RM 81000V, R. M. Young, Inc., Traverse City, MI) were logged at 10-Hz to CR1000x dataloggers (Campbell Scientific, Inc., Logan, UT, USA). Datalogger times were synced to a common computer that was synced to the internet prior to heading in the field.

Sonic Anemometer Sensor Specifications

The RM Young sonic specifications (Table 1) are to guide the user. All data collected were archived and it is the user's responsibility to determine which data are valid for their application.

Table 1. RM Young sonic anemometer 8100V specifications.

RM YOUNG ULTRASONIC ANEMOMETER 81000V	
Wind Speed	
Range:	0 to 40 m/s (0 to 90 mph)
Resolution:	0.01 m/s
Threshold:	0.01 m/s
Accuracy:	±1% rms ±0.05 m/s (0 to 30 m/s) ±3% rms (30 to 40 m/s)
Wind Direction	
Azimuth Range:	0.0 to 359.9 degrees
Elevation Range:	±60.0 degrees
Resolution:	0.1 degree
Accuracy:	±2° (1 to 30 m/s) ±5° (30 to 40 m/s)
Speed of Sound	
Range:	300 to 360 m/s
Resolution:	.01 m/s
Accuracy:	±0.1% rms ±0.05 m/s (0 to 30 m/s wind)
Sonic Temperature	
Range:	-50 to +50 ºC
Resolution:	0.01 ºC
Accuracy:	± 2 °C (0 to 30 m/s wind)

The RM Young sonic manual can be found in the Supplements section of “A multiscale study of the coupling between flow, fire and vegetation static field experiments: three-dimensional wind and temperature (2025)”.

Sonic Anemometer Location

A single CSV (FtStewart_2025_Sonic.csv) identifying the sonic file name, location, burn unit and the start and end time of the data collected (Table 2).

Table 2. "FtStewart_2025_Sonic" Table Description.

COLUMN	UNITS	DESCRIPTION
FILE_NAME		File name excluding the file extension. File could be either .csv for data or .html for visual representation.
BURN_UNIT		Burn unit.
SONIC		Sonic number.
DATE	YYYY-MM-DD	Date of data collection.
EASTING	m	Easting (X) coordinate in NAD 1983 UTM Zone 17N (EPSG: 26917).
NORTHING	m	Northing (Y) coordinate in NAD 1983 UTM Zone 17N (EPSG: 26917).
HAG	m	Height above ground (meters).
AT_START	HH:MM:SS	Archive start time (Zulu).
AT_END	HH:MM:SS	Archive end time (Zulu).
NOTES		Notes.

Sonic Anemometer Data Description

A single CSV per sonic per burn unit (Table 3) and an HTML data visualization (Figure 4). Sonic data are separated by date of burn. A photo of the tower setup is included to give visual representation of the vegetation immediately surrounding the tower.

- File name – Loc_Year_Month_Day_Sonic*.ext
    - Where:
        - Loc – location of the study (FtStewart=Fort Stewart).
        - Year – year of study (2025).
        - Month – month of study (04).
        - Day – day of study
        - Sonic* – sonic number (1 or 2).
        - ext – file type (csv, html, jpg).
- Missing data – TIMESTAMP and RECORD were added to align sensors, variables with missing timestamp were set to NaN.
- All data collected within the AT_START and AT_END times are included. Suspect data are noted with a DIAG code.
- DIAG = 0 – valid, all else suspect. Refer to manual for specific DIAG codes greater than 0.
- Values outside of sensor specs are included and identified in DIAG code. Use at own risk or remove.
- HTML graphs only include data with DIAG code = 0.

Table 3. "Sonic Anemometer Data" Table Description.

COLUMN	UNITS	DESCRIPTION
TIMESTAMP	Datetime	Date and time (Zulu) in YYYY-MM-DD HH:MM:SS.0. Note in Excel, set the specified format (yyyy-MM-dd hh:mm:ss.0) using the custom category to view the data correctly.
RECORD		Unique record identifier.
Ux	m/s	Sampled horizontal wind direction (x; east/west) in meters per second. Positive values of x (+) indicate wind from the east, negative values (-) indicate wind from the west.
Uy	m/s	Sampled horizontal wind direction (y; north/south) in meters per second. Positive values of y (+) indicate wind from the north, negative values (-) indicate wind from the south.
Uz	m/s	Sampled vertical wind direction (z) in meters per second. Positive values of z (+) indicate upward wind direction, negative values (-) indicate downward wind direction.
T	°C	Sampled sonic temperature, calculated from speed of sound measurements in degrees Celsius (±2 °C).
DIAG	Coded	Sonic diagnostic code (0 – valid, non-zero code – invalid measurement) as described in the manual.
NOTES	Text	Notes on sonic (Sonic Orientation)

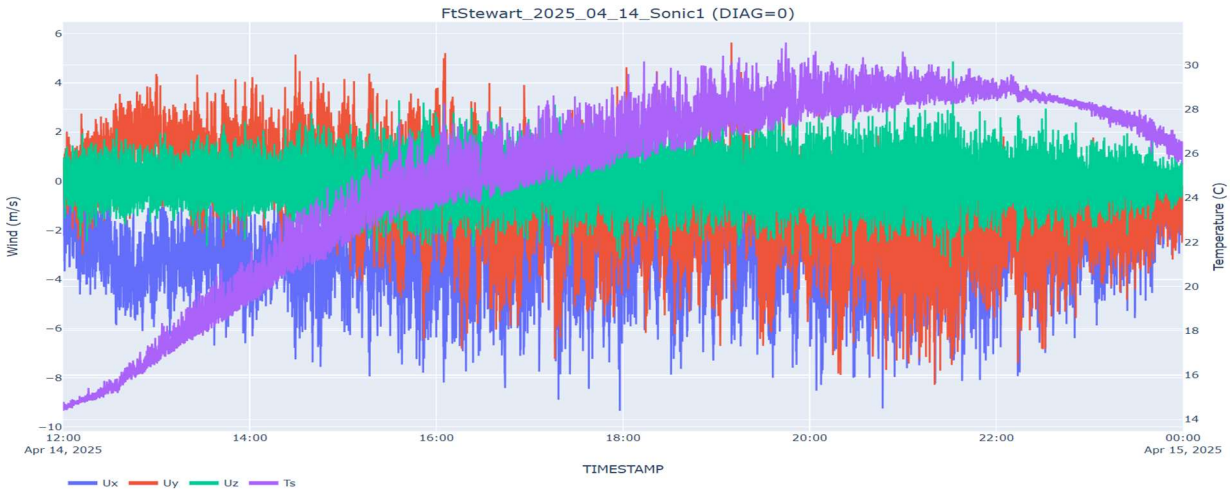

Figure 4. Example sonic data graph sonic data including Ux, Uy, Uz wind directions (m/s) and Temperature (deg C).

Sonic Anemometer Error

A single CSV (FtStewart_2025_SonicError.csv) that identifies the percentage of missing data (NaN) and data with suspect diagnostic codes (Table 4).

Table 4. "FtStewart_2025_SonicError" Table Description.

COLUMN	UNITS	DESCRIPTION
BURN_UNIT		Burn unit or units' sonic data were collected for.
SONIC		Sonic number.
MISS_AT_START	s	Missing time (seconds) from the archive start time (defined in the Burn Summary section). Identifies missing data at the beginning of the file (e.g., the sensor was not on at archive start time).
MISS_BT_START	s	Missing time (seconds) from the burn start time (defined in the Burn Summary section). Identifies missing data at the time the fire is considered burning (e.g., the sensor was not on at burn start time).
MISS_AT_END	s	Missing time (seconds) from the end of data collection (defined in the Burn Summary section). Identifies missing data at the end of the file (e.g., the sensor cut out before the end archive time was reached).
Ux_ERROR	%	Horizontal wind direction (Ux) error (percent). The percentage of NaN values during data collection.
Uy_ERROR	%	Horizontal wind direction (Uy) error (percent). The percentage of NaN values during data collection.
Uz_ERROR	%	Vertical wind direction (Uz) error (percent). The percentage of NaN values during data collection.
Ts_ERROR	%	Temperature error (percent) for each data column. The percentage of the data with NAN values where data were collected.
DIAG_ERROR	%	Diagnostic error (percent). The percentage of data where DIAG code was not equal to zero.