Sierra Cascade Intensive Forest Management Research Cooperative Proposal 11-01
Sunscald and Frost Effects

Principal Investigator: Jason Warshawer

Title: Sunscald and Frost Effects on Douglas-fir Survival

Year Funded: 2011

Executive Summary:

In recent years, Douglas-fir has been increasing as a percentage of planted species in many of our plantations. Douglas-fir is one of the more difficult conifer species to get established. Minimizing the number of seedlings lost to mortality and the subsequent replanting costs represent the greatest opportunity for cost savings in establishing our plantations. The purpose of this study is to quantify the amount of mortality to planted Douglas-fir seedlings resulting from sunscald and/or frost. Imbedded in the study will be an investigation of the most cost effective ways to protect Douglas-fir seedlings from sunscald.

Planting sites on lands managed by Co-op member Roseburg Resources were proposed for the initial installations of the study.

Planting stock type will be Styro-8's. Planting spacing will be 8 feet by 12 feet. A replication will consist of 20 seedlings. Each treatment will be replicated four times for a total of 320 trees per study site. The four treatments include: sun protection with mesh screen/wire bracket, frost protection with plastic tubing, sun protection with calcium carbonate, and control.

Data collection will consist of survival exams conducted annually at the end of the growing season. These exams will be conducted for three consecutive years following initial planting.

A pre-harvest spray of 2% Chopper plus oil was applied in September of 2008. The study site was harvested in 2010. The site was single ripped in July and Velpar was applied in November of 2010.

2011: The study site was planted in May by Co-op members from Roseburg Resources and Thunder Road Resources. The treatments were applied immediately following planting by the same Co-op members.

This site was one of those visited during the Co-op field trip in June.

Instruments for collecting soil/weather data were installed in July. Sensors for collecting soil temperature were buried to a depth of 10 centimeters at five randomly located spots in the study site. Sensors to record air temperature were installed 12 inches above ground immediately adjacent to seedlings receiving the four treatments. There were nine of these sensors installed. The sensors located in the plastic tubing treatment were placed within the tube. Finally, two temperature-collecting stations equipped with radiation shields for the sensors were located at either side of the study site. The sensors at these stations were five feet above the

ground. All sensors have 2-hour recording intervals.

The calcium carbonate treatment had to be reapplied three times during the year due to rain washing the material off of the treated seedlings. Employees from Roseburg Resources did all of the reapplication work. Minor maintenance was required on the screen/wire bracket and plastic tubing treatments during the year.

Survival counts were done in late October/early November. First year survival ranged from 94 to 96 percent with no significant differences between treatments. There were numerous brown tips on seedlings in the plastic tubing treatment. Also, some terminal buds were clipped by wildlife in this treatment.

Second-year survival will be taken at the end of the growing season in 2012.

2012: In mid-May, a walk-through examination of the study site revealed extensive mortality in all treatment replications. Based on this finding, a systematic survival survey was conducted on May 23rd. Survival of the treatments (November 2, 2011 survival in parenthesis) was as follows: Control 7.5% (93.75%); Shade Screens 18.75% (93.75%); Plastic Tubing 10% (96.25%); and Calcium Carbonate 16.25% (95%).

Based on the timing of the two survival surveys, this mortality was obviously a winter event. Following the May survival survey, data were downloaded from the temperature sensors that were located throughout the study site (see above write-up for 2011 as to placement of the sensors). A sample of this data can be found at the end of this report. The data revealed that starting the last few days in October, 2011 and continuing through mid-April 2012, the site was subjected to low temperatures below 20 degrees for most of the period. There were two periods (each about a week long) of 0 degree weather in the last half of January and again in the first part of February. Soil temperatures during these times dropped to the mid-thirties. A lack of snow cover contributed to these low soil temperatures. There were tremendous swings between daytime/nighttime readings. Coldest temperatures were recorded in the plastic tubes.

A final survival survey was conducted on November 7th. Results of this survey revealed that survival continued to fall during the summer: Fall 2012 survival levels: Control 2.5%; Shade Screens 8.75%; Plastic Tubing 6.25%; and Calcium Carbonate 2.5%. The study was abandoned at this time.

Temperature Sensor Data Key:

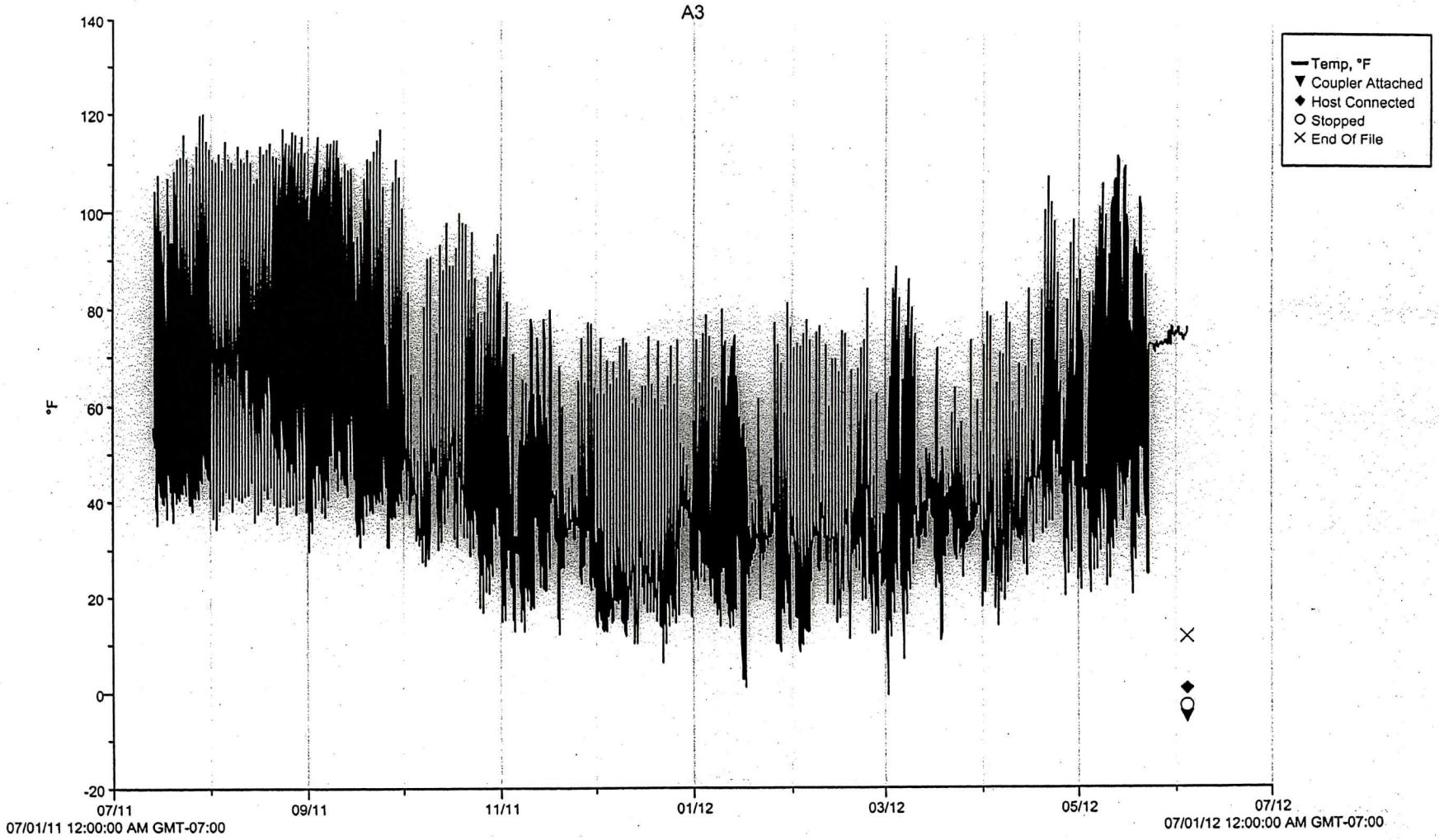
A3 (Control) - sensor installed 12 inches above ground immediately adjacent to a seedling

G5 (Ground) – sensor buried to a depth of 10 centimeters

R2 (Radiation Shield) – sensor installed at 5 feet above ground

S2 (Shade Screen) – sensor installed 12 inches above ground immediately adjacent to a seedling

T2 (Plastic Tube) – sensor installed 12 inches above ground inside the plastic tube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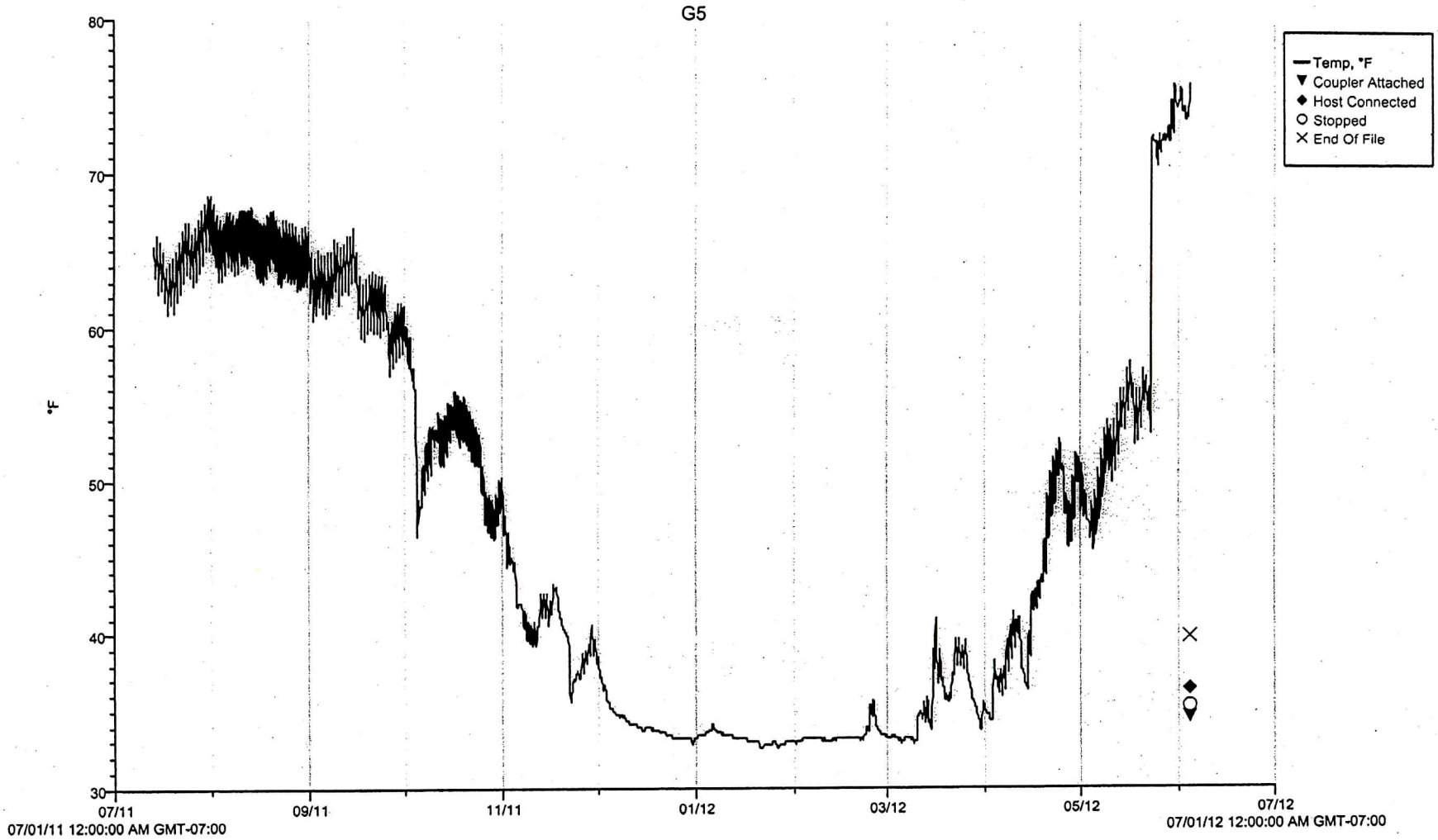
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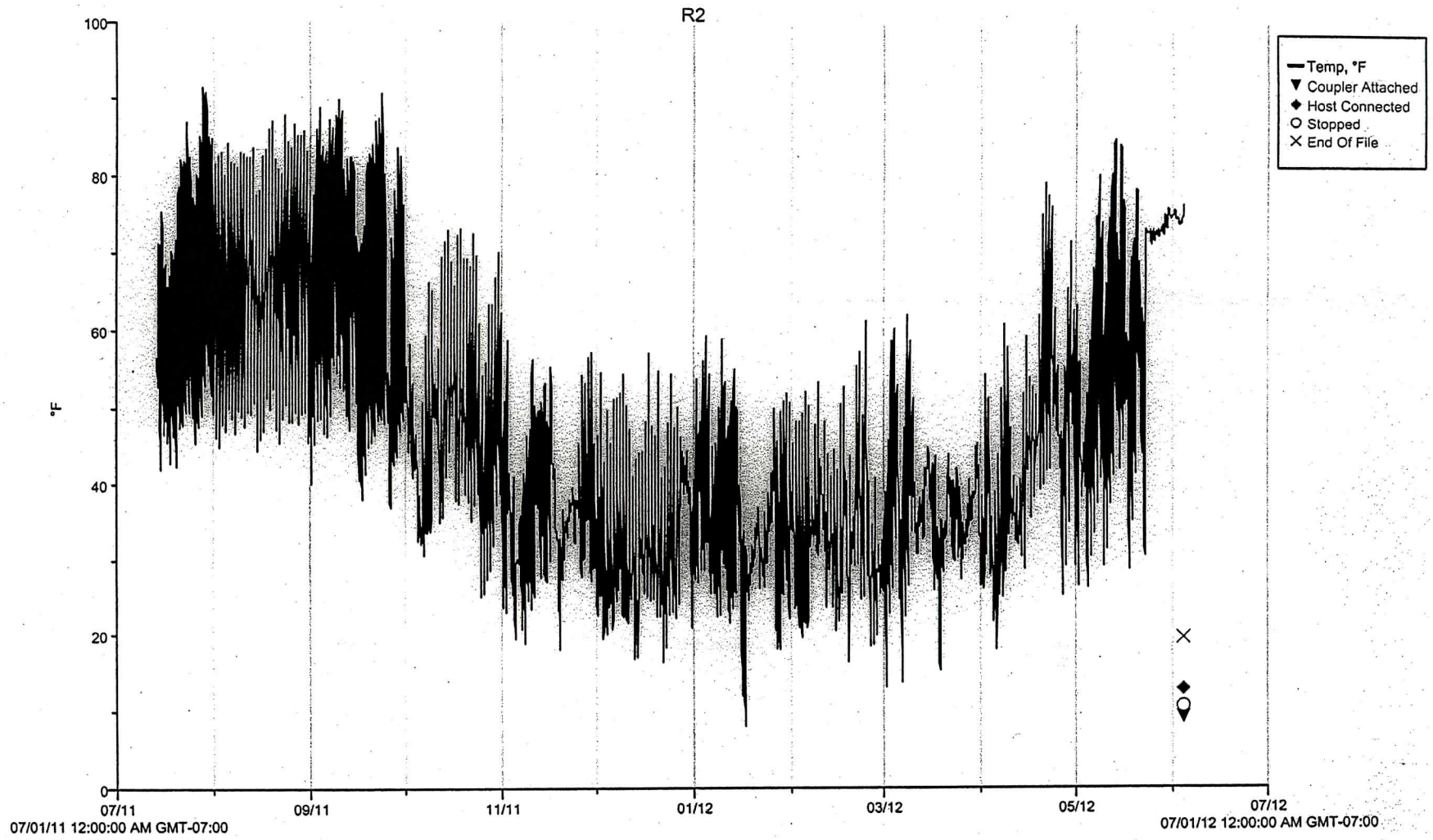
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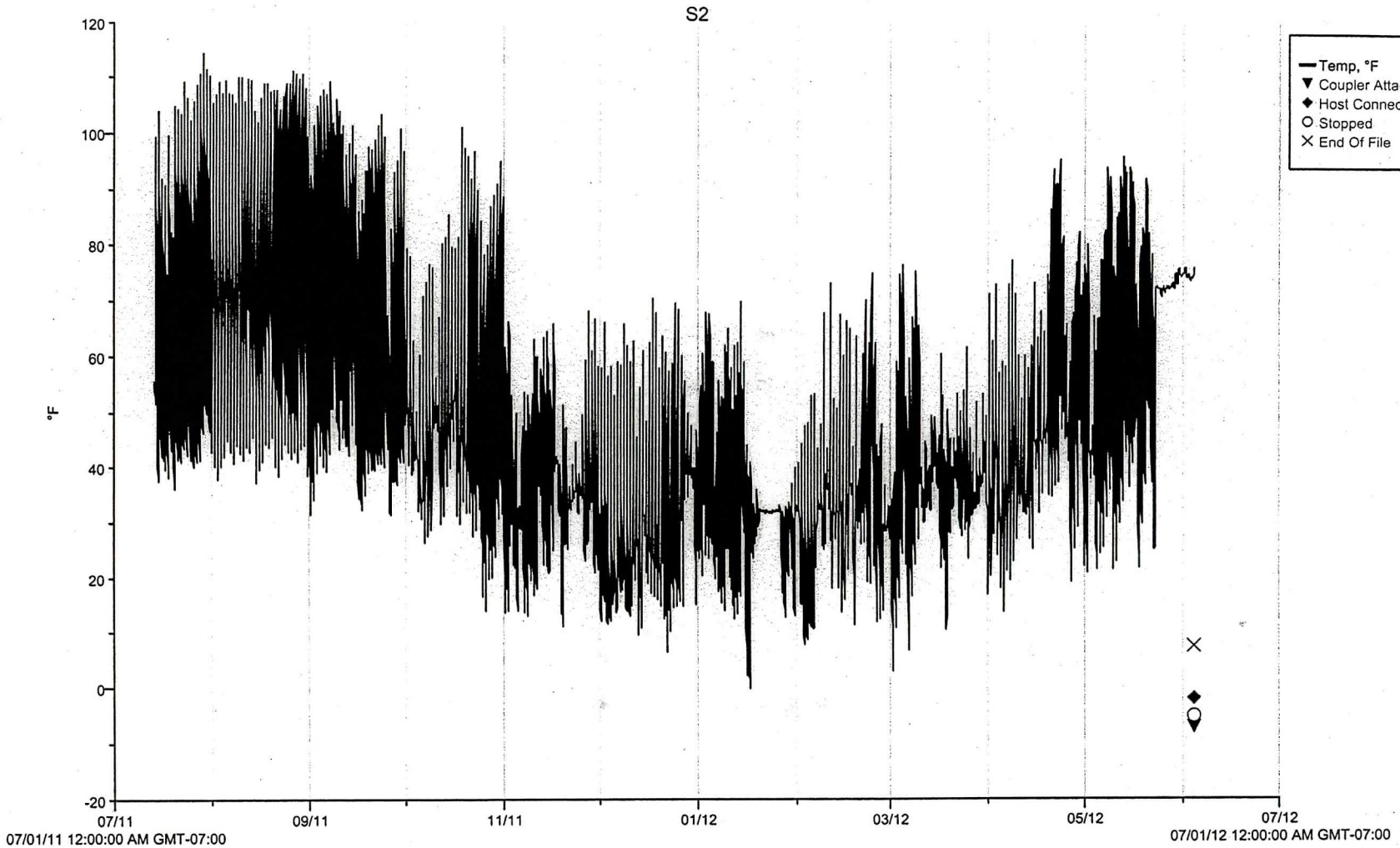
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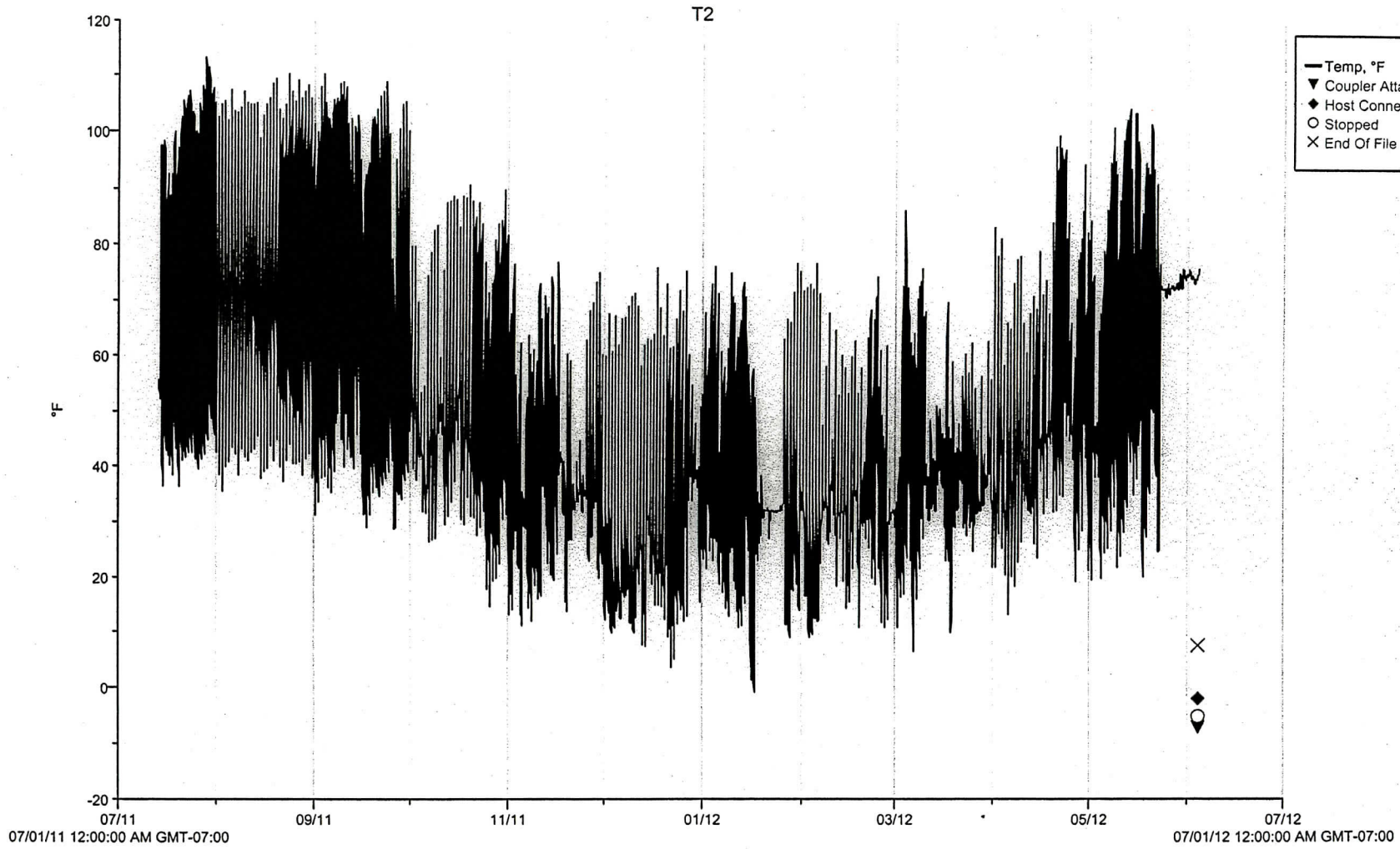
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