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WEATHER CONDITIONS ASSOCIATED WITH UNDERSTORY PRESCRIBED BURNING IN SOUTH GEORGIA

by James T. Paul, Curtis S. Barnes and James C. Turner, Jr.

RESEARCH DIVISION

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WEATHER

The Uncontrollable Limiting Factor in a Prescribed Burning Program

by James T. Paul, Curtis S. Barnes and James C. Turner, Jr.

Fire provides the southern forester with an economical and effective tool for use in wildlife habitat enhancement, removal of hazardous accumulations of fuels, disease control, seedbed preparation, and species management. Almost 500,000 acres were burned in Georgia during 1972 for these varied management objectives (Hough and Turner 1974). Timing of a burn (hour of ignition, season), firing technique (headfire, backfire, etc.), manpower and equipment, placement of firelines, and weather are elements a forest manager must consider for a successful burn. All these elements, except weather, can be partially or wholly manipulated by the forester. Consequently, weather usually is the uncontrollable limiting factor in a prescribed burning program. Typically a forester plans the burn (selects firing technique, plows fireline, etc.), then waits for the unique set of weather variables suitable for conducting his burn to meet a specific management objective. Sometimes it is a long vigil.

Meteorology has progressed in this country from occasional observation and comment by medical doctors, a military expedition, or curious citizens to a high-technology science involving electronic sensors, high-speed digital computers, satellite observations, and mathematical models used to estimate the state of the atmosphere out to 72 hours. Curiously, the use of weather data in planning and executing prescribed burning has changed relatively little in the past 20 to 40 years. Perhaps this is partially due to an incomplete knowledge of how the various weather elements interact with the fuel complex to generate reproducible rates of spread, flame height, residence time, and fireline intensity. Also, foresters frequently do not have a clear understanding of sources of weather data, which weather elements are subject to unexpected change on the short time scales relevant to prescribed fire, and how these important weather/fire variables vary over relatavely short distances. For example, a manager might conduct a successful burn in one county, but in the adjoining county, weather conditions could produce a fire too cool or too hot.

In this study, data are presented that describe spatial and diurnal variability of the weather elements important for prescribed burning, the frequency of major weather systems that are responsible for rapid change of these variables, and the application of data in the Forestry Weather Interpretations System (FWIS) to the prescribed burning problem.

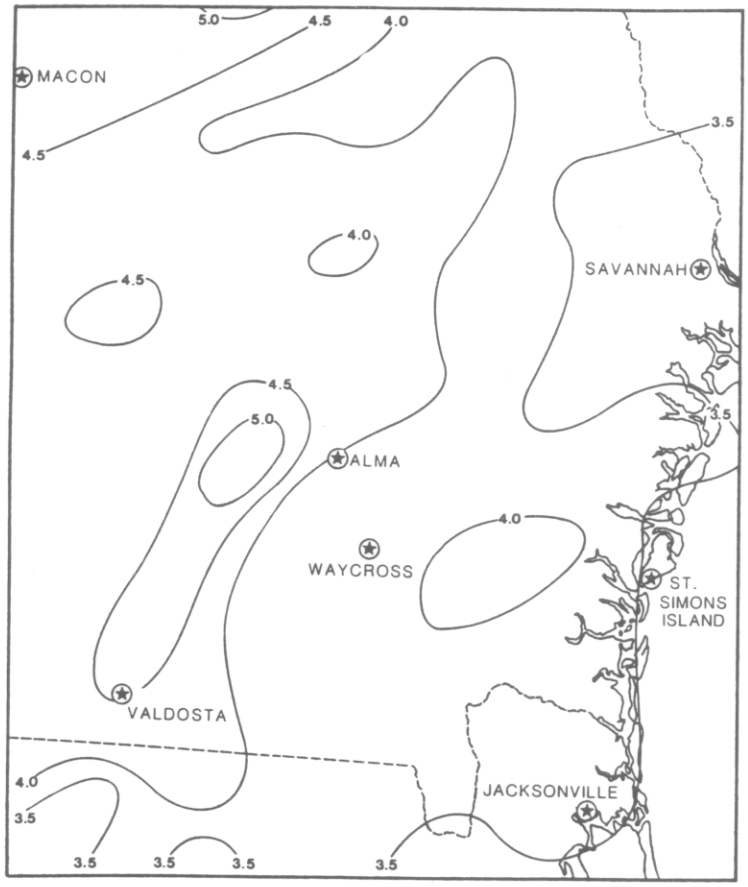

Figure 1. --Average February rainfall in inches, south Georgia, 1954 to 1963.

WEATHER ELEMENTS THAT INFLUENCE PRESCRIBED BURNING

The National Weather Service (NWS) provides Georgia forestry forecasts which include information on rainfall type (rain, rain shower, thunderstorm, etc.), the expected amount and duration, and the probability of occurrence for today, tonight, and tomorrow. NWS also provides estimates of today's maximum, tonight's minimum, and tomorrow's maximum temperature; today's minimum, tonight's maximum, and tomorrow's minimum relative humidity; and highest wind for today, tonight, and tomorrow.

Rainfall

The rainfall history at a burn site is the single most important weather element influencing total fuel moisture. Lack of rainfall, especially over long periods, or recent heavy rains may result in fire intensity inconsistent with the management objective.

Rainfall during October through May is usually associated with frontal systems that produce a relatively uniform spatial distribution when compared to spotty summertime showers. However, even the lower spatial variability of frontal rain may be important for prescribed burning. For example, during February (1954-1963), the average monthly rainfall varied almost 2 inches over south Georgia (figure 1). Averaging over a long period smooths the variability associated with individual storms; consequently, on a given day, variable fuel moisture over fairly short distances should be expected even though there was a general rain across the state. The exact timing of a rainfall event is difficult and is probably the most common error in precipitation forecasts. However, attention to the latest available forecast should avert most problems that foresters experience with precipitation timing.

Temperature

Air temperature contributes to the rate at which fuels dry, but more directly, it influences needle scorch. In general, the higher the air temperature, the greater the scorch potential. Mobley et al. (1978) recommend an air temperature in the range of 30° - 50°F. There are modifying factors that permit burning at higher temperatures with no great increase in the scorch potential. For example, when burning under a mature stand the crowns are high and heat generated by the fire has a better opportunity to dissipate. Other compensating factors include a higher windspeed, which dissipates heat from the fire, or a higher fuel moisture, which produces a lower intensity fire. Experienced burners frequently burn with air temperatures up to 60°F with appropriate attention to the compensating factors. Conversely, a burn in a young plantation might require an air temperature of no more than 40°F to avoid damaging scorch. Air temperature is relatively easy to forecast, but a major departure from the forecast can occur if timing is off on the passage of a frontal system or when the percentage of sky covered by clouds is different from what is expected.

Relative humidity

Next to precipitation, relative humidity is the major factor influencing fine fuel moisture. If the humidity is low, finer fuels (such as the upper layer of pine needles and grass) will burn within a few hours after rain. Since the finer fuels are largely responsible for rate of spread, it is of obvious importance to the manager. Rapid changes in humidity may occur with frontal passage (cold, warm, occluded, or sea breeze) and when the air becomes unstable with resultant vertical mixing.

Relative humidity is also relatively easy to forecast with major departures (forecast vs. observed) occurring with timing and intensity errors on frontal systems. The guideline for relative humidity is 30-50 percent (Mobley et al. 1978). Burning at less than 30 percent is risky because of the higher fire intensity and potential for spotting usually associated with these lower humidities. Burning at humidities appreciably higher than 50 percent may result in a missed management objective.

Wind

Once the fire is ignited, wind has the potential to create more problems than any other weather element. Wind at a specific time and place is relatively difficult to forecast. Accuracy of wind-direction forecasts increases with increasing windspeed. Less than 5-7 mph (measured at 20 feet in the open) surface friction and unequal surface heating of different soils and vegetation types interact to increase the variability of wind direction over a short period. At the low speeds, a predominant direction can be specified, but it should be understood that observed wind direction may visit all points of the compass within a 5- to 10-minute period. Many burns are planned as either headfires or backfires, and a deviation of more

than 45 degrees in wind direction may defeat the management objective through its influence on fire intensity, rate of spread, and the increased potential for control problems. An example of a wind-direction shift is shown in figures 2 and 3 for an experimental burn near Waycross, Georgia, during the spring of 1982. Figure 2 is typical of a backfire where the wind bends the flame into the burned area. Figure 3 is the same fire about 5 minutes after a wind shift occurred. Mobley et al. (1978) recommend a windspeed of 2 to 10 mph in the stand, or 5 to 18 mph in the open. Low windspeeds contribute to needle scorch since heat tends to rise vertically instead of being dissipated horizontally as with stronger winds. The most common cause for forecast error in wind (more than 5 to 7 mph) is missed timing on frontal passages and failure to anticipate degree of pressure system intensification.

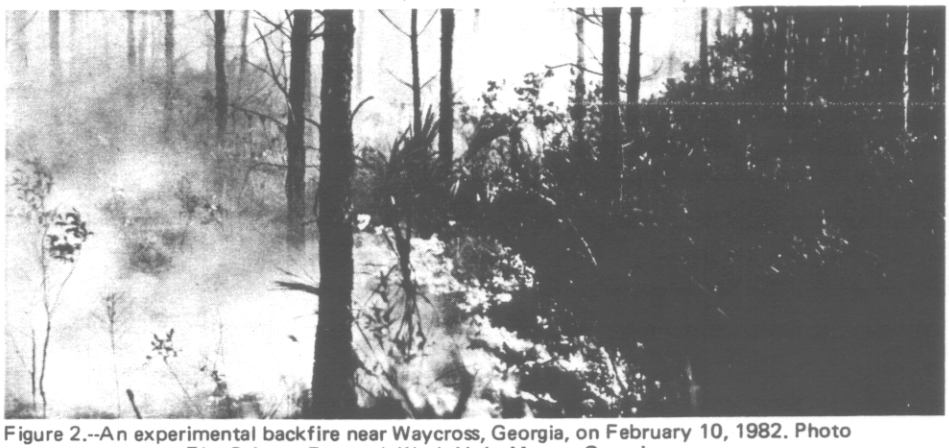

Figure 2.--An experimental backfire near Waycross, Georgia, on February 10, 1982. Photo courtesy Fire Science Research Work Unit, Macon, Georgia.

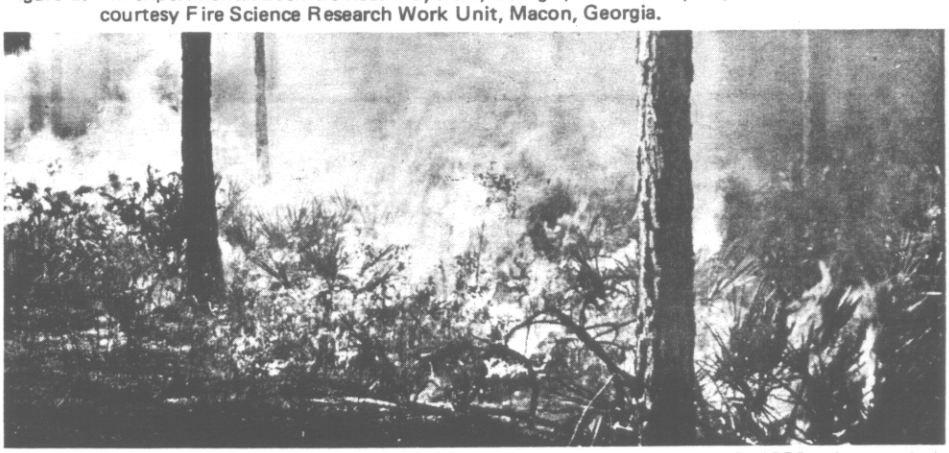

Figure 3.--An experimental backfire near Waycross, Georgia, on February 10, 1982, after a wind shift. Photo courtesy Fire Science Research Work Unit, Macon, Georgia.

MAJOR WEATHER SYSTEMS AND PRESCRIBED BURNING

Major changes in individual weather elements occur with the movement of weather systems. Those systems that commonly produce major changes, especially those with the potential to change during the course of the burn, will be discussed.

A typical frontal system (figure 4) has cold, warm, and occluded fronts as boundaries between warm, cool, and cold sector air masses. A cold front is cold air moving over an area formerly occupied by warm air (the temperature drops with passage), and a warm front replaces cool air (the temperature increases with passage). An occluded front occurs when the faster moving cold front forces the warm air sector aloft. The actual frontal zone is not a sharp, narrow band but is typically a diffuse zone where rapid changes in weather occur. The cold frontal zone is usually 10 to 50 miles wide, while the zone associated with warm fronts may be more than 100 miles wide. Occluded fronts may have a wide band of weather, but those that pass through Georgia usually are very similar to cold fronts.

Warm fronts that influence Georgia weather usually move from the Gulf of Mexico, traveling in a northerly direction. Cold fronts approach Georgia from the west, northwest, north, and occasionally from the northeast. Occluded fronts usually approach from the west. The following discussion will focus on cold fronts because the best burning conditions usually occur after a cold frontal passage.

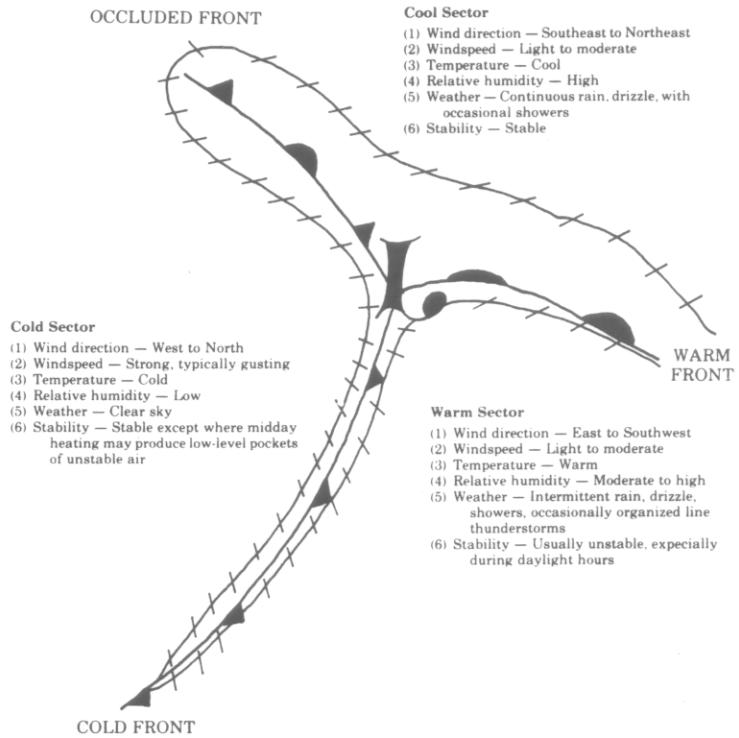

Figure 4.--Diagramatic frontal system with a description of weather commonly associated with each sector. Area inside the hatched line indicates where precipitation is most probable.

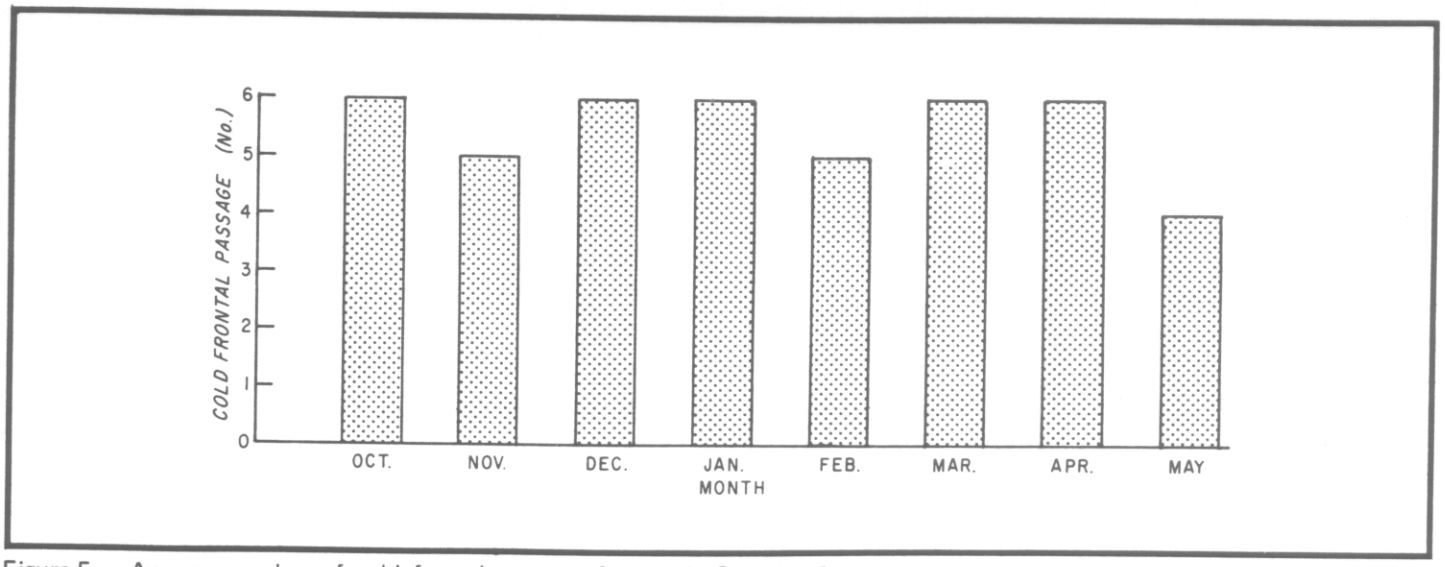

Figure 5. --Average number of cold frontal passages for south Georgia, October through May, 1968, 1969, 1978, 1979.

Cold front

The passage of cold fronts in south Georgia from October through May averaged six fronts per month or one about every 4 or 5 days (figure 5). The average number of frontal passages in November and February was five, while May averaged only four. Conditions suitable for prescribed burning usually occur 2 or 3 days after a rain-producing cold frontal system has passed. The probability that a second front will pass within 7 to 8 days after initial frontal passage is about 85 percent (figure 6). There is also about a 30 percent probability that a second front will pass within 3 days of the initial front. The high frequency of these systems is a major limitation on the probable number of days with good prescribed burning conditions in Georgia.

The results of a cold frontal passage on an active prescribed burn can be devastating. Typically, wind shifts from a southwesterly direction to northwest and speed increases to 10 to 15 mph with gust potential of 30 to 35 mph. Humidity might drop from the high 90s to less than 30 percent within a few hours. Temperature might drop from the high 70s to 40° or lower with a strong front. The frontal zone itself is an area of rapid change where various physical forces are adjusting to a new equilibrium as the front moves forward. Consequently, wind direction may shift or spin around to all points of the compass until the front is well past the burn site.

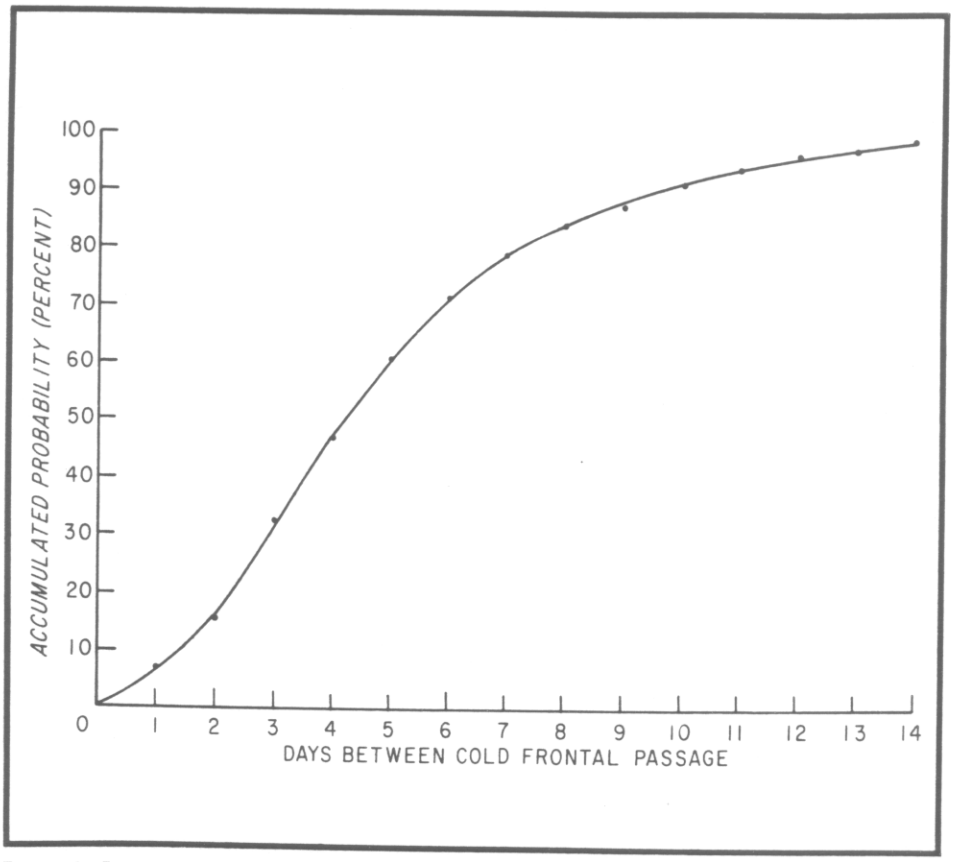

Figure 6.--Probability (%) of a cold frontal passage occurring within a specific day (1-14) given a passage on day 0 for the period October through May in south Georgia.

Sea breeze front

The Georgia coastline from the Savannah River in the north to the St. Mary's River in the south is periodically influenced by a heat-driven sea breeze front. Figure 7 is a diagramatic representation of a sea breeze front, showing typical weather behind and ahead of the front. An Atlantic Coast sea breeze front is unlikely to occur and move inland when there is a strong westerly wind. Favorable conditions for formation and movement are a weak wind and pressure field over land and high land temperatures when compared to the ocean. As the hot air over land rises, it is replaced with cooler air flowing from the ocean.

During the 1960s and 1970s, the U. S. Forest Service operated an automated weather collection system in the coastal strip in cooperation with the U.S. Navy (Paul and Williams 1971, Williams 1973). Figures 9, 10 and 11 are based on a portion of these data collected at the Harris Neck Wildlife Refuge (see figure 8 for location). The frequency of sea breeze fron-

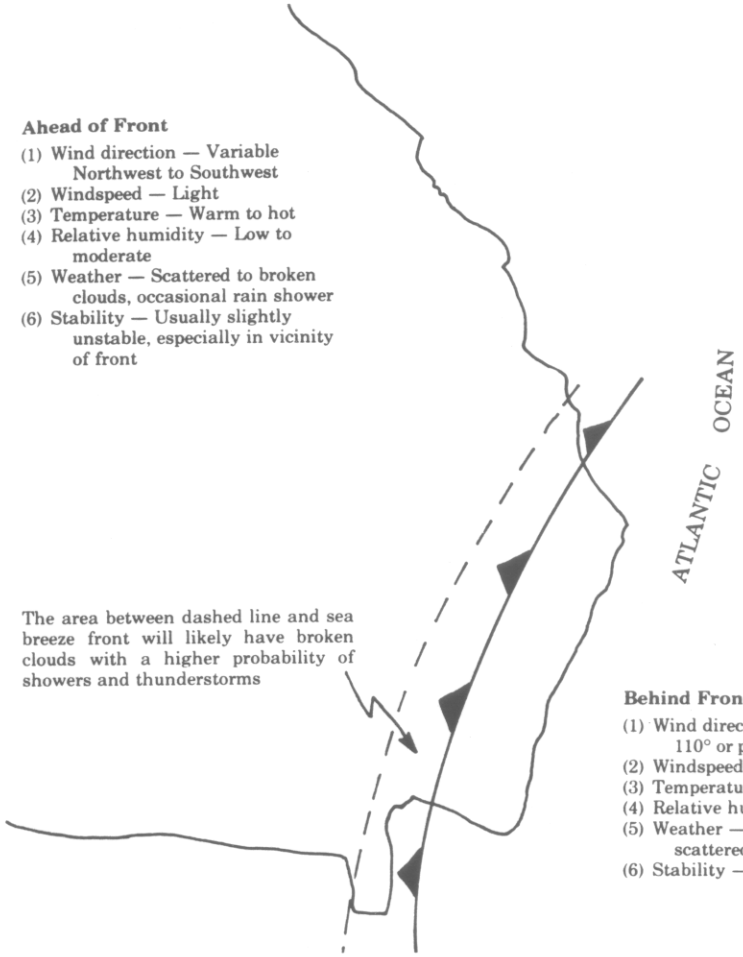

Figure 7.–A diagramatic sea breeze front with descriptions of conditions ahead and behind front.

Figure 8.--Location map of study area.

tal systems reached a maximum in May, largely because land/sea temperature differences are greater during this month (figure 9). The minimum number of passages occurred in December, while the average for all months was eight. Favorable conditions for a sea breeze occurrence are likely to be persistent on consecutive days. This is reflected by the 40 percent probability of sea breeze front tomorrow if one has occurred today (figure 10).

Most sea breeze passages occurred between 1200 and 1500 e.s.t. with no occurrences before 0800 or after 1800 e.s.t. (figure 11). If a sea breeze front has not passed Harris Neck by 1500 e.s.t., the chances of one passing after 1500 e.s.t. become progressively smaller. Data presented by Williams (1973) on passage time and inland penetrations of the sea breeze front were reanalyzed for this study. There is a seemingly logical inconsistency in the data because more sea breeze fronts pass a point 10 to 15 miles inland than at locations 0 to 10 miles from the ocean (figure 12). According to Williams, not all sea breeze fronts that form on a given day retreat to the ocean or dissipate during the late afternoon and nighttime hours. Consequently, on the succeeding days, the front begins its inland movement from its current position (or forms at an inland location) and never passes the more seaward points. As a result, some coastline zones may be influenced by flow from the ocean for 24 to 72 hours with attendant higher fuel moisture, higher winds, and lower temperatures. If a sea breeze front passes in the 10- to 15-mile coastal zone, then figure 12 can be used to roughly estimate the depth of inland penetration and the likely arrival time of the front.

The sea breeze influences prescribed burning in the following ways:

1. With passage, the wind may shift 45 to 180 degrees and will usually increase in speed.
2. Humidity will increase and temperature drops behind the front, and the burn may not be as hot as planned.
3. The zone immediately ahead of the front is typically unstable. If a stand is being burned under potentially high fire-danger conditions, the approach and passage of a sea breeze front could result in excessive scorch, unacceptable mortality, or an escaped fire.
4. The sea breeze is a weak frontal system (figure 7) and, to the observer on the ground, has the appearance of surging back and forth over a given location before final passage. The result of this surging action on burning would be similar to that discussed in 3 above, but might generate additional problems due to multiple passages.

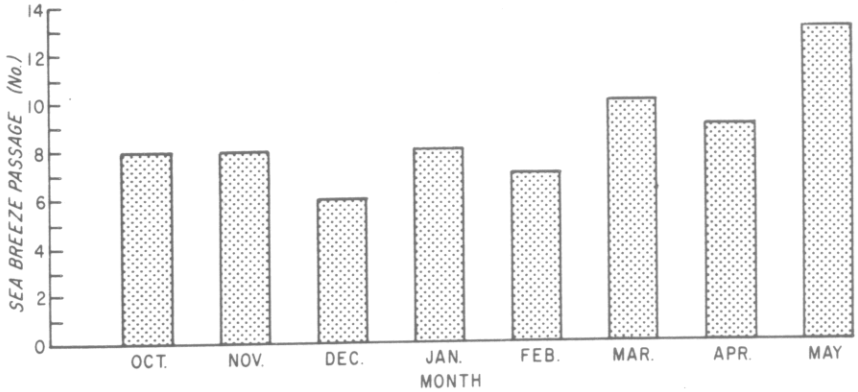

Figure 9.--Average number of sea breeze frontal passages at Harris Neck National Wildlife Refuge for a 3-year period 1967-1970 (Williams 1973).

SPATIAL VARIABILITY OF PRESCRIBED BURNING WEATHER

Weather can vary over relatively short distances even in the absence of fronts or other major meteorological systems. November is typically a dry month with clear skies and light or calm winds. With these conditions, local site factors (vegetative type, soil series, etc.) are more obvious in their influence on weather elements, such as the daily range of temperature. With no wind, how energy from the sun is absorbed and reradiated determines air temperature at a specific location. Over water, the daily temperature range would be small compared to what might be observed over an asphalt surface. Forested sites fall somewhere between these extremes. With increasing windspeed, the influence of site factors begins to disappear and vanishes at some higher windspeed due to rapid mixing of the air near the surface.

By plotting temperature range, one might expect some hint of spatial variability in temperature due to site (figure 13). The zone of rapid change along the coastline reflects the differences in how energy from the sun is absorbed and reradiated over land and water. If there was no wind, there would be a single sharp line dividing the temperature over land vs.

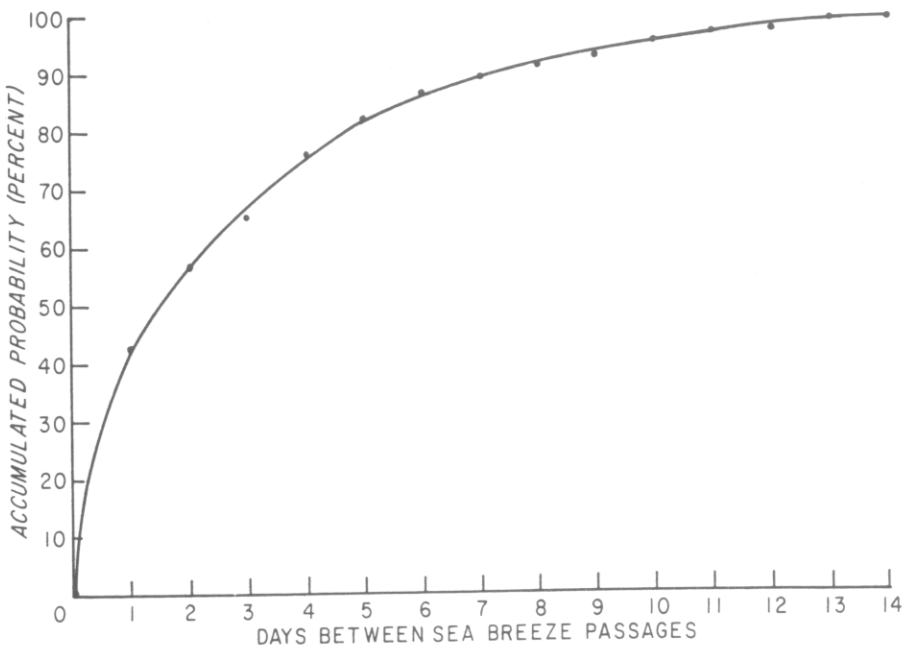

Figure 10.--Probability (%) of a sea breeze frontal passage occurring within X days (1-14) given a passage on day 0.

that over water. Frontal systems and other weather systems mix the air over land and water, and convert the dividing line to a more diffuse zone. The magnitude of the temperature range (about 18°-20°F) is less near the coast due to the moderating influence of the ocean.

A second area of fairly rapid change in temperature range was found north of Valdosta. This is in the agriculture belt of Georgia, and the vegetation is mixed forests and agriculture crops. This suggests that the differing vegetative types over short distances at least contribute to the observed range. The vegetation between Valdosta and Brunswick is largely pine forests, and the spatial change of temperature range is small in this area.

NWS observational stations are usually located at airports where large open spaces are common (figure 14). Forestry fire weather stations (figure 15) are typically located in smaller clearings and are more likely to reflect local site conditions. Data from Georgia Forestry Commission stations in Turner, Mitchell, and Lowndes Counties (see figure 8 for location) were chosen instead of NWS stations for the portion of this study relating to space differences in order to show maximum differences that might occur over relatively small distances. These data (figures 16-19) are useful to illustrate the spatial variability of weather. For example, if the 1300 e.s.t. observation at a fire weather station is:

Temperature	70°F
Relative humidity	40 percent
Windspeed	10 mph
1-hour timelag fuel moisture[1/]	6 percent

the probability that similar values will occur within a 50-mile radius of the observing station is:

- Temperature (figure 16): Within ± 5° or less, 80 percent of the time
- Relative humidity (figure 17): Within ±10 percent or less, 80 percent of the time
- Windspeed (figure 18): Within ± 2 mph, 80 percent of the time
- 1-hour timelag fuel moisture (figure 19): Within 2 to 3 percent or less, 80 percent of the time.

Figures 16-19 are valid only for the area and months used to develop the curves. However, they highlight three major points important for prescribed fire that should be generally true for any comparable-size area or time period:

1. Spatial variability of weather data is usually low for most days.
2. On some days the variability is high (temperature ± 15°F, relative humidity ± 30 percent, windspeed ± 10 mph, and fuel moisture ± 15 percent.
3. If a prescribed burn is conducted on a high variability day, the burner may experience different weather at the burn site from what existed at a central office. If he proceeds without an onsite observation (such as with a belt weather kit), the results of the burn could be dramatically different from that expected, or result in an escaped fire.

1/ Fuel moisture was calculated from temperature, relative humidity, and cloud cover.

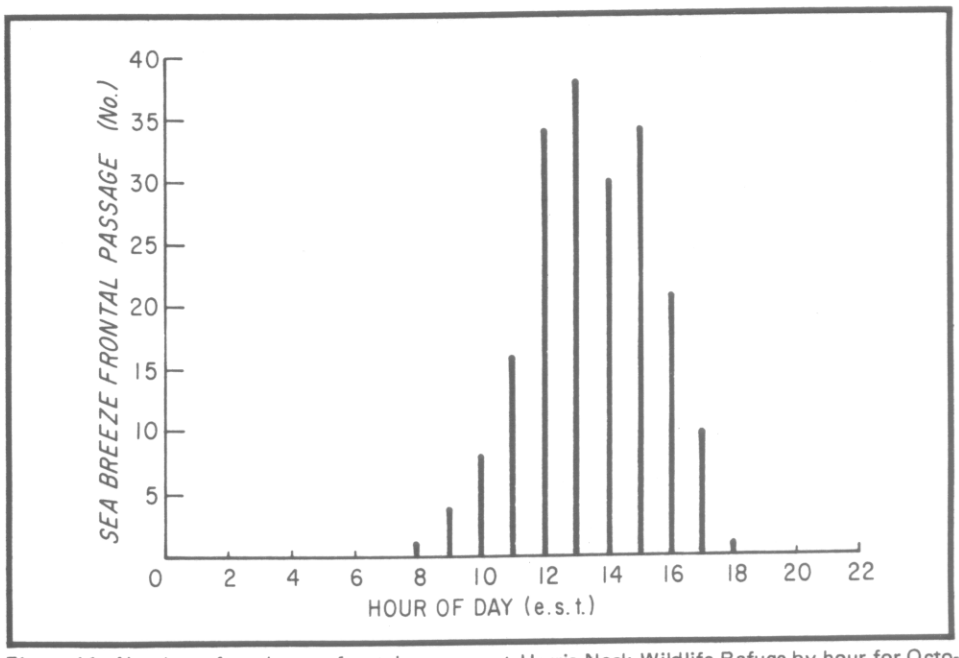

Figure 11.--Number of sea breeze frontal passages at Harris Neck Wildlife Refuge by hour for October through May (Paul and Williams 1971).

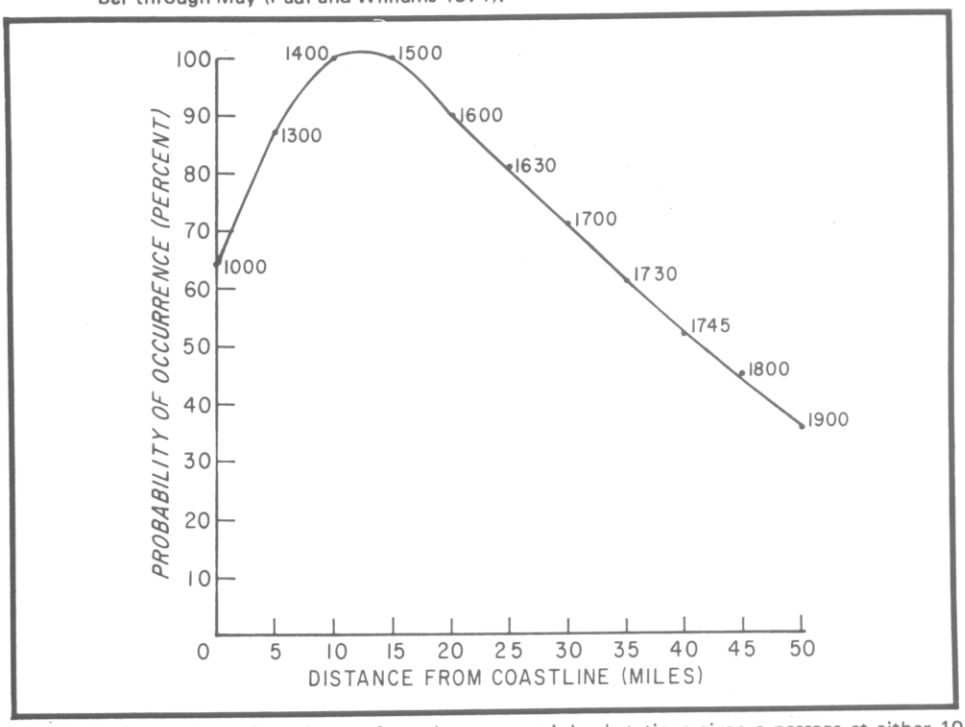

Figure 12.--Probability of sea breeze frontal passage at inland stations given a passage at either 10 or 15 miles. Representative passage times (e.s.t.) are plotted on the curve (Williams 1973).

DIURNAL VARIABILITY OF PRESCRIBED BURNING WEATHER

Changes in weather over a 24-hour period at a given location usually exceed spatial variability within a 50-mile radius of an observation point. The days available for prescribed burning might be increased if the manager could tailor his burn time to take advantage of the 24-hour variability in weather.

The diurnal curves for temperature (figure 20), relative humidity (figure 21), windspeed (figure 22), and 1-hour timelag fuel moisture (figure 23) are based on 10

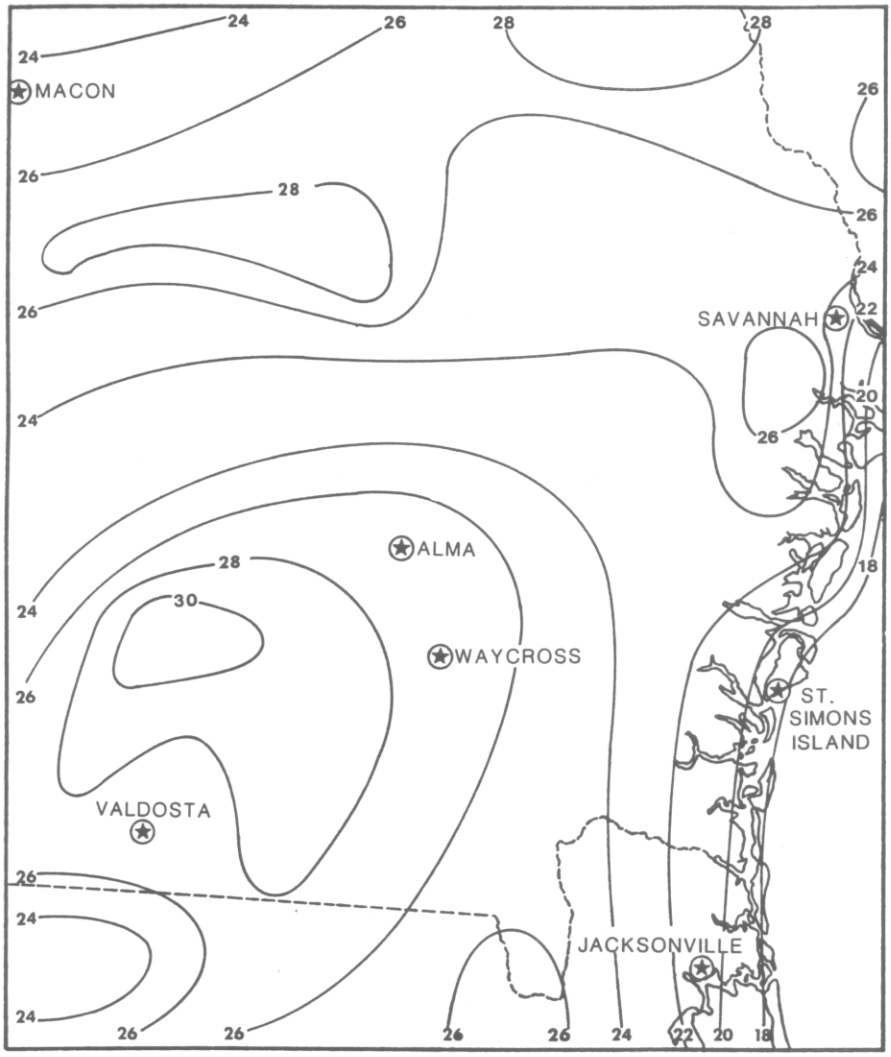

Figure 13.--Average November temperature range in degrees F, south Georgia, 1954 to 1963.

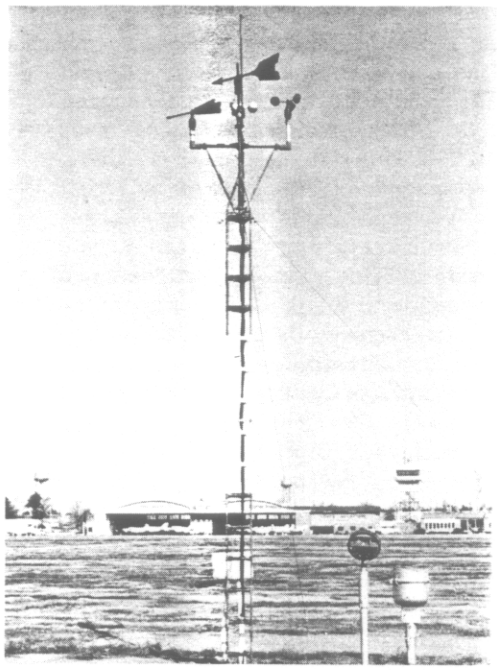

Figure 14.--National Weather Service instrument site at Cochran Field, Macon, Georgia.

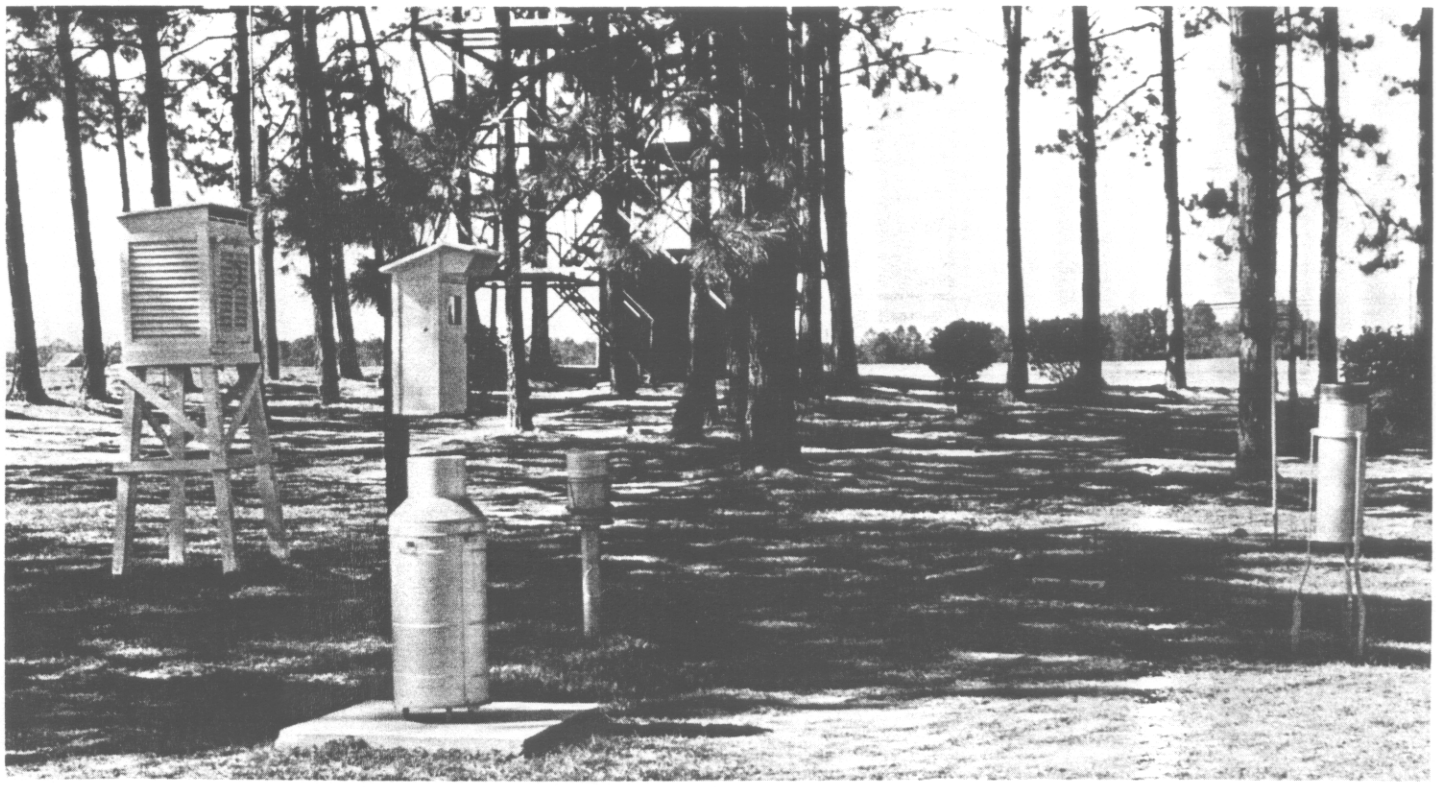

Figure 15.--Georgia Forestry Commission fire weather station at Turner County, Georgia.

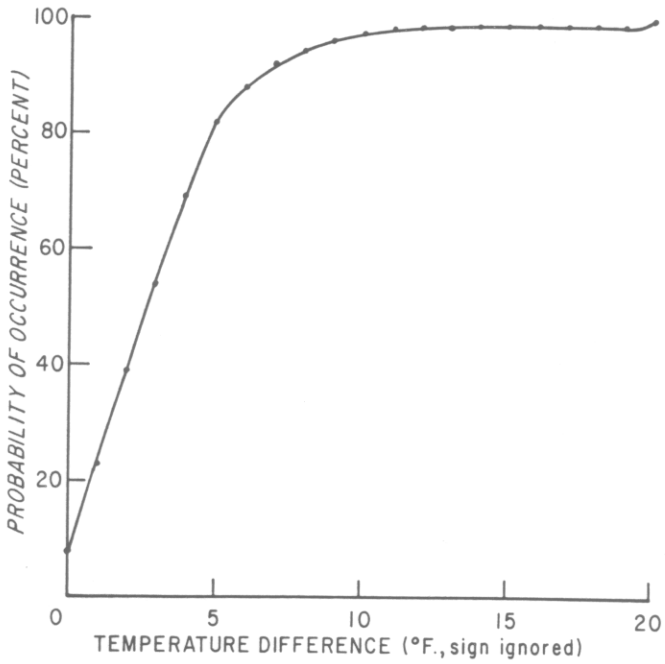

Figure 16.--Probability of air temperature varying less than value specified on X axis within 50 miles of an observation, based on 2 years of 1300 e.s.t. observations.

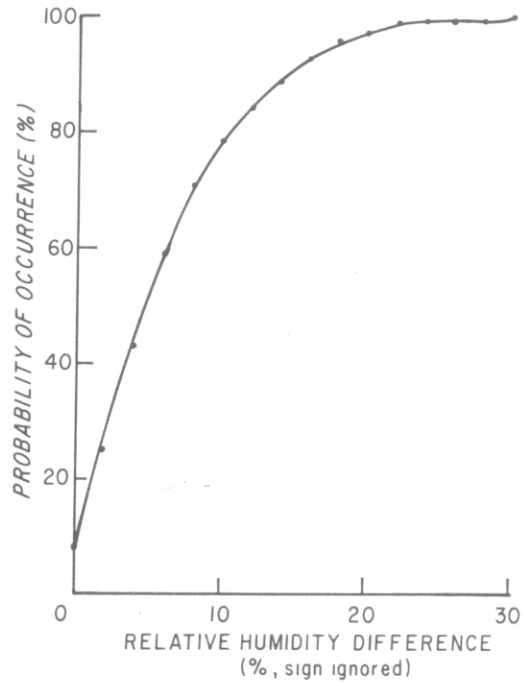

Figure 17.--Probability of relative humidity varying less than the value specified on the X axis within 50 miles of an observing station, based on 2 years of 1300 e.s.t. observations.

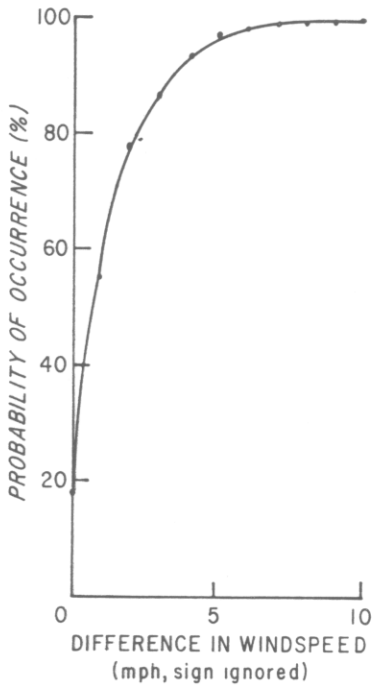

Figure 18.--Probability of windspeed varying less than the value specified on the X axis within 50 miles of an observing station, based on 2 years of 1300 l.s.t. observations.

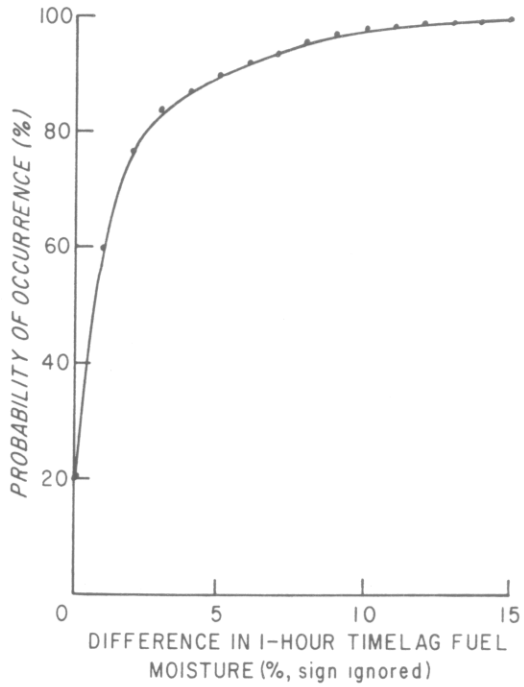

Figure 19.--Probability of 1-hour timelag fuel moisture varying less than the value specified on the X axis within 50 miles of an observing station, based on 2 years of 1300 e.s.t. observations.

cases of 3 successive days of data after frontal precipitation. The upper and lower limits (Mobley et al. 1978) are shown on each figure. The number of hours within a prescription limit, the beginning hour, and ending hour can be approximated by using these figures if an observation and forecast are available that contain as a minimum:

1. Observed
   a. Temperature
   b. Relative humidity
   c. Windspeed
   d. Cloudy or sunny

2. Forecast
   a. Maximum temperature
   b. Minimum relative humidity
   c. Maximum wind

Assume a 1000 e.s.t. observation was available (point A in the figures)

Temperature	35°F
Relative humidity	50 percent
Windspeed	5 mph
Sunny	

and a forecast (point B in the figures)

Maximum temperature	51°F
Minimum relative humidity	35 percent
Maximum windspeed	10 mph

By plotting the appropriate observation (point A) and the forecast (point B) on figures 20-23, and by constructing a dashed line through points A and B roughly parallel to the climatological curve, one can estimate when the weather variables will be within prescription. For example, temperature would be within limits all day except for a short period in midafternoon, when it would be 51°F. This small excursion outside the preferred range would not be of importance for most burns. Relative humidity would be in range from 1000 to about 1900 e.s.t. When burning in an area where a hot fire could produce lethal temperatures, consideration should be given to adjusting the time of burn away from the relative humidity minimum at 1400.

Windspeed does not follow a smooth diurnal curve, but figure 22 does represent what is commonly observed, i.e., after a cold frontal passage, windspeed drops sharply after sundown and picks up after sunup. For a 1- or 2-hour period before and after sunup and sunset, the wind field is undergoing adjustment to reflect changing surface-heating conditions. Typically, both windspeed and direction can be quite variable near sunup and sundown. Where wind is critical, these hours should be avoided or otherwise accounted for in the burn plan. The climatological curve and the sample plot (dashed line, figure 23) shows 1-hour timelag fuel moisture slightly below the preferred range from about 1100 to 1700 e.s.t.

FREQUENCY OF WEATHER VARIABLES USED IN PRESCRIBED BURNING

Foresters frequently use the 1300 e.s.t. observation in conjunction with a weather forecast in making decisions for prescribed burning because this is usually the only observation available. The preferred range of weather variables (Mobley et al. 1978) for prescribed burning is:

Temperature	20°-50°F
Relative humidity	30-50 percent
Windspeed (20 ft. open)	5-20 mph
Fuel moisture	7-20 percent

Frequency of occurrence of these weather variables was computed with data for October through May when these weather variables were within the preferred range in Turner, Mitchell, and Lowndes Counties. Temperature was the single most limiting variable, occurring in the preferred range only about 20 percent of the time (Table 1). The upper limit of temperature can be raised to about 60° if the stand has a low scorch potential. Relative humidity was the least limiting factor at Turner and Mitchell, and was within the preferred range almost half the time. In general, the overall frequency of individual variables was about the same for Turner and Mitchell Counties, with Lowndes exhibiting a somewhat different overall pattern.

Average February maximum temperatures range from the low 60s near Savannah to just over 70° near the Florida border (figure 24) As expected, temperature increases toward the southern part of the state. Stands less susceptible to scorch as a result of higher ambient temperature could be burned on the days with higher temperatures. Because the desired temperatures occur on only 20 percent of the days during the burning season, a manager should plan to fully utilize these days when they do occur. This can be done effectively by matching climatology with burning objectives and the resources available to conduct the burn.

Variable	Preferred Range	Percent frequency within preferred range
	Turner County	
Temperature (°F)	20 - 50	22
Relative humidity (%)	30 - 50	48
Windspeed (mph)	5 - 18	29
Fuel moisture (%)	7 - 20	32
	Lowndes County	
Temperature (°F)	20 - 50	17
Relative humidity (%)	30 - 50	35
Windspeed (mph)	5 - 18	48
Fuel moisture (%)	7 - 20	27
	Mitchell County	
Temperature (°F)	20 - 50	20
Relative humidity (%)	30 - 50	48
Windspeed (mph)	5 - 18	37
Fuel moisture (%)	7 - 20	30

Table 1.-- Frequency of occurrence of individual weather variables used in prescribed burns for the months October through May, 1978-1979, in three Georgia counties.

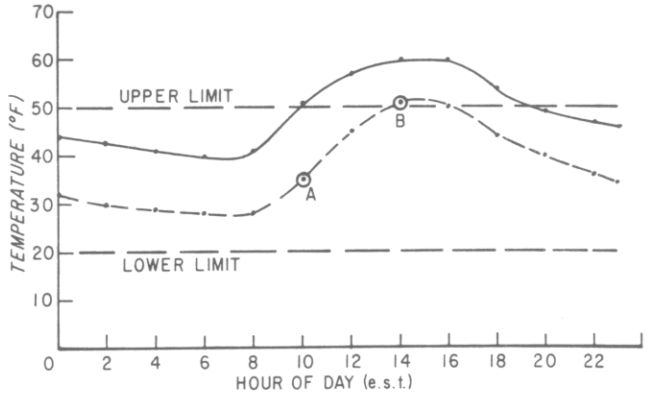

Figure 20.--Average diurnal temperature curve for 3 days after precipitation occurred. Data are averaged for three south Georgia NWS stations. The upper and lower limits for prescribed burning are shown with an expected curve constructed using a 1000 e.s.t. observation (A) and the forecast maximum (B).

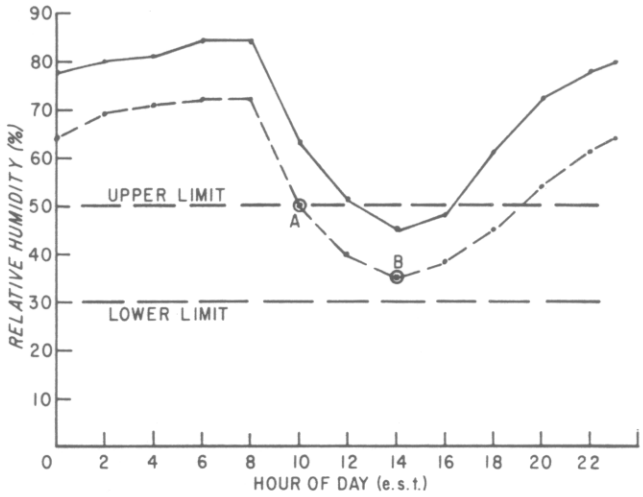

Figure 21.--Average diurnal relative humidity curve for 3 days after precipitation occurred. Data are averaged for three south Georgia NWS stations. The upper and lower limits for prescribed burning are shown with an expected curve constructed using a 1000 e.s.t. observation (A) and forecast minimum (B).

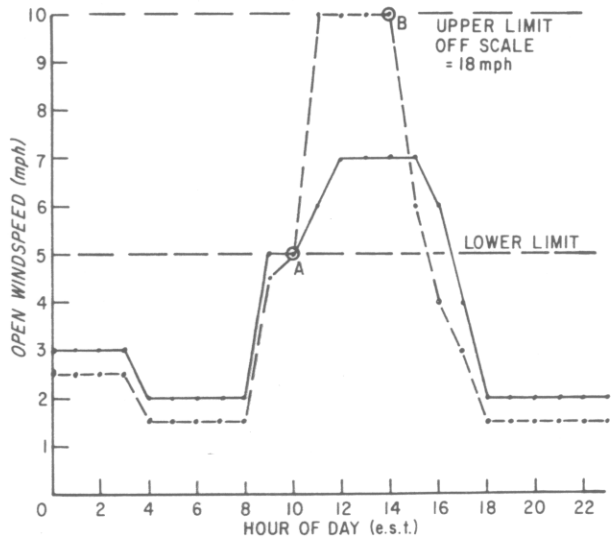

Figure 22.--Average diurnal windspeed curve for 3 eays after precipitation occurred. Date are averaged for three south Georgia NWS stations. The upper and lower limits for prescribed burning are shown with an expected curve constructed using a 1000 e.s.t. observation (A) and the forecast maximum (B).

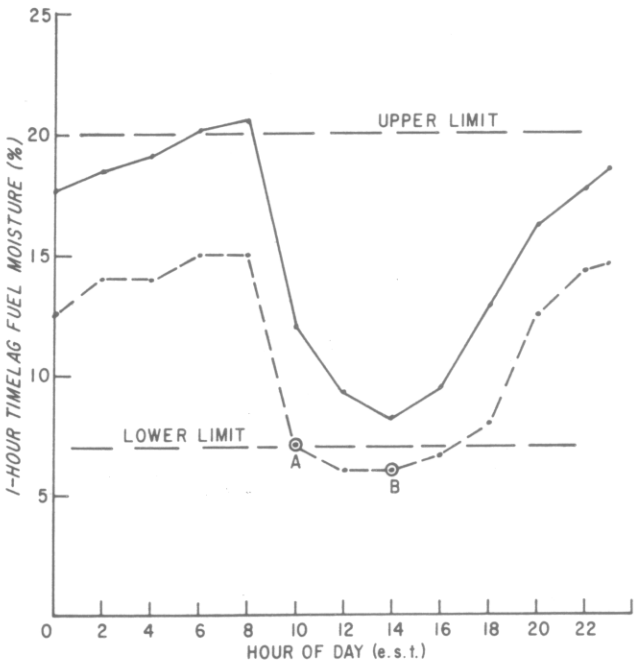

Figure 23.--Average diurnal 1-hour timelag fuel moisture curve for 3 days after precipitation occurred. Data are averaged for three south Georgia NWS stations. The upper and lower limits for prescribed burning are shown with an expected curve constructed using a 1000 e.s.t. observation (A) and the forecast maximum (B).

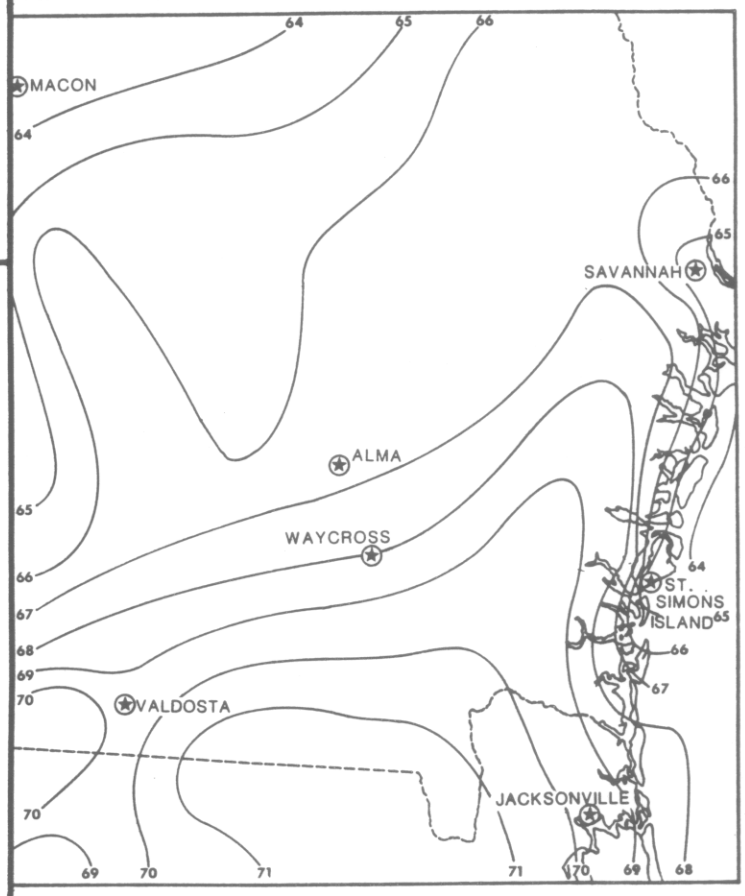

Figure 24.--Average February maximum temperature in degrees F, south Georgia, 1954 to 1963.

The Forestry Weather Interpretation System As An Aid To Prescribed Burning

The Forestry Weather Interpretations System (FWIS) was designed to provide the forest manager with current weather (updated hourly in some cases) localized to his operational site, with interpretation as to how it might apply to his management problem. It is a computerized system, but no previous training in computer science or meteorology is required for effective use of the system.

The system is resident on a computer at the University of Georgia. FWIS was developed as a cooperative endeavor between the Georgia Forestry Commission, the U.S. Forest Service, the National Weather Service, and the University of Georgia Office of Computing Activities. It was developed to meet the expressed needs of forestry and designed in close consultation with operational foresters. The result is an easy-to-use, "user friendly," system (Paul and Clayton 1978). In lieu of directly accessing the system, a burner can request this service from any Georgia Forestry Commission District Office. The District Offices are equipped with terminals, and the professional staff can access the system and advise the burner of weather conditions appropriate for his location.

To access the system one must have:

1. An office telephone
2. A computer terminal (purchase price starts at about $1,000)
3. A valid user number at the University of Georgia

FWIS can be used for (system product names are shown below in bold type):

1. Planning: PRESMOK, RXBURN
2. Monitoring weather for near-term planning:
   a. REGION.--An overview of weather in the South and its general implication for forestry
   b. Hourly maps (MAP) of temperature, humidity, wind, cloud cover, and current weather
   c. FDFCST.--District forescasts for today-tonight-tomorrow
   d. GAMAP.--A plot of existing weather at NWS office locations
3. Day of burn:
   a. OBSI.--Observational data from NWS stations can be used to estimate weather at a burn site
   b. FDFCST.--District forecast data for today-tonight-tomorrow
   c. FORCST.--Interpolated forecast for today-tonight-tomorrow
   d. RXBURN.--Evaluation of observed and forecast variables being in the preferred range (Mobley et al. 1978) and an estimate of the smoke management problem.[2/]

Perhaps the greatest utility of FWIS to a burner is as an aid in "surprise prevention." For example, if on the day of the burn, the weather estimated at the burn site by OBSI does not agree with the forecast, it would be advisable to seek clarification with NWS. Disagreement between forecast and observation is an expression of our current imperfect understanding of weather. This should alert the forester to a potential problem, which can be resolved by consultation with a knowledgeable meteorologist who will have the latest information on which to base a forecast revision if required.

* * *

SUMMARY

Once the burn is ignited, success is largely dependent on weather at the burn site. Exactly how the various weather elements interact with each other and the fuel complex being burned is imperfectly known. Consequently, the forester, of necessity, will burn many times with a large measure of uncertainty that his management objective will be met. By careful planning and attention to current and expected weather, this uncertainty can be minimized.

2/ RXBURN combines the information found in OBSI, FDFCST, and FORCST.

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