

FIRE FATALITY ACCIDENT REPORT

GOLDEN GATE ESTATES FIRE
January 30, 1985

#8

Fort Myers District
Florida Division of Forestry

ACCIDENT BRIEF

At approximately 3:15 p.m., on Wednesday, January 30, 1985, a Florida Division of Forestry employee was killed while plowing a fireline on a wildfire in Golden Gate Estates near Naples, Florida. The victim was a Forest Ranger in the Ft. Myers District of the Florida Division of Forestry.

Marco A. Miranda, Age 26, was using a tractor to construct a fireline when the head of the fire blew up with great intensity. The victim died of Carbon Monoxide Poisoning secondary to smoke inhalation according to the Coroner's Report.

The incident occurred on the Golden Gate Estates Fire approximately 8 miles northeast of Naples, Florida.

FINDINGS

PERSONNEL

1. The victim met minimum State Fire Standards training requirements, but his actual fire fighting experience was limited to 22 fire assignments.
2. Structured training relating to unique local fire behavior conditions was not provided to personnel.
3. Fatigue was a contributing factor. Victim had been on duty until 10:00 p.m., the previous day.
4. Personnel on fire considered the situation to be routine, until fire blew up.
5. Fire personnel were unable to explain the severe fire behavior experienced.
6. Victim was making an attack on fire where nothing could be gained from the attack.
7. No structured safety briefings were provided at district or local level to firefighters.
8. Cause of death determined to be carbon monoxide poisoning secondary to smoke inhalation.

FIRE BEHAVIOR

1. A blow-up situation existed. Freeze kill of fuels, drought conditions, and winds combined to create the potential for an intense blow-up condition. Head fires burning on adjacent blocks to the west and to the east and somewhat ahead of the fire where the fatality occurred created a draft situation that contributed to the blow-up.
2. Severe fire behavior occurred during the blow-up.
3. There was a rapid transition from "routine fire" conditions to blow-up conditions.
4. Extreme rate of spread during blow-up resulted in a very short time for reaction by the victim, precluding escape or deployment of fire shelter.
5. Fire occurred in severe fire weather during the normal fire season. Fire weather for this day was extreme.

FIRE MANAGEMENT

1. Florida Division of Forestry policy is to control wildfires quickly at the smallest acreage possible. The primary tactic was direct attack on the fire head with plows without burning out.
2. Several houses were in the fire area. Suppression strategy was to protect houses.
3. Initial manning and subsequent reinforcement was a total effort for the district. Incident Command Team was called in after the fatality.
4. Personnel on the fire were not aware of the extreme fire danger.
5. The potential for a blow-up situation was not recognized by supervisory personnel on the fire.
6. Fire weather forecasts for this part of Florida are inadequate and do not have credibility with fire personnel.
7. Proper precautionary actions relating to safety of personnel were not taken. Several of the standard firefighting orders and the thirteen situations that shout, "watch out", were not observed.

8. Poor judgment was exercised in the tactical decision on the location of the tractor.
9. Fire Dispatch Logs for January 30, 1985, gave no indication that Forest Ranger Miranda was dispatched to the fire or that he arrived at the fire scene.
10. Fire Dispatch Logs are nearly illegible, with numerous omissions.

EQUIPMENT

1. All protective clothing required by the Division of Forestry was present. Victim was wearing polyester blend uniform pants and a Nomex fire shirt.
2. Fire Shelter was found between top and bottom cushions on tractor seat.
3. Fire Shelter was not deployed.
4. The tractor was found to have no apparent mechanical deficiencies.

WEATHER

1. Palmer Drought Index indicated a mild drought in the area.
2. Relative humidity was approximately 31% on January 30, 1985; winds were from the South at 17 Knots.
3. No rain had been received in the district for the past two weeks or more.

CAUSES

Unusual fire behavior brought on by drought conditions - no rain since January 18, 1985. Palmer Drought Index for this area during this time period was -2. A hard freeze on January 21 and 22, 1985, had killed much of the fine fuels and the normally green vegetation. At the time of the accident, the weather station at the Big Cypress Reserve measured temperature of 80° and relative humidity of 31% along with a wind speed of 8-12 mph. The proximity of head fires in adjacent blocks in front of this fire created a condition that contributed to the fire burning rapidly and with great intensity.

Personnel in the District had not recognized the increased hazard brought on by the freeze-killed fuels, as the drying process had been gradual. The normal drought fuel conditions and loadings had been elevated greatly because of the freeze-kill in the grasses, shrubs, palmetto, and brush.

1. The potential for a blow-up situation was not recognized by personnel on the fire.
2. A blow-up situation existed.
3. Extreme rate of spread during blow-up resulted in inadequate time for reaction by victim precluding escape or deployment of fire shelter.
4. Local fire behavior conditions created by the block arrangement combined with coastal wind shifts were overlooked by fire supervisory personnel.

FIRE BEHAVIOR ANALYSIS

Fire Behavior condition for Golden Gate fire 1/30/85

General Conditions:

Southern Florida and area of incident had not experienced any significant rainfall since January 18, 1983. In addition to these factors there was a hard freeze in mid-January, killing most herbaceous vegetation. Dead leaves had charred, turned brown but had not fallen.

Specific conditions:

Fuels: Fuels in the fire area were primarily two types. In the better drained areas, the fuel was slash pine with grass, gallberry, palmetto understory (fuel model 7). In the low areas the fuels were wax myrtle, cabbage palm, dormant vines, grass, and numerous other woody brush special under dormant cypress (fuel model 4). Brush ranged in height from 12 to 20 feet and was very dense. Leaves on branches and grasses had been killed by the frost, thereby reducing the amount of live fuel available in this fuel type. There was no standing water in the low areas. It was in the low area with heavy brush (fuel model 4) that the accident occurred.

Fuel loading for the pine and palmetto was estimated to range from 2-4 tons per acre. Fuel loading for the brush and cabbage palm was estimated to range from 12-17 tons/acre.

Fire Weather

No readings were taken on the fire line. Readings from weather service taken at Naples, approximately 12 miles west were:

1000 AM	-	Temp	67°	-	RH	-	54%	wind	S	14	Knots
1200 noon	"	"	74°	"	"	-	48%	"	S	17	"
1500 PM	"	"	75°	"	"	-	52%	"	S	17	"

Readings from Miles City tower approximately 30 miles east from weather station ID# 372-CB 2A4 were:

1100 AM	Temp	63°	RH	85%	winds	E	2,	clear
1330 PM	"	86°	RH	31%	winds	SE	3,	clear
1500 PM	"	82°	RH	35%	winds	S	4,	clear

One observation taken at S.W. Regional Airport in Ft. Myers was 85° AND RH 35% at 1300 hrs.

Based on weather observations east and west at the fireline the following readings were interpreted for the purpose of computing the rates of spread.

1. First 2 hours of fire after initial attack - approximately 1100-1300 hrs.
Temp. 78°, RH 42%, wind speed, mid-flame - 3.
2. Second 2 hours - 1300-1500 hrs., Temp. 78°, RH 33%, wind speed, mid-flame 7.

Fire Behavior

Suppression efforts began on fire when it was approximately 15-20 acres just south of a Range Network of rectangular shaped suburban, subdivided zone approximately 12 miles east of Naples. Homes are scattered throughout this area. Fire moved northward into this zone, suppression efforts were with tractor/plow units and engines.

Crews were having difficulty containing fire because of high fire intensity and spotting ahead of the fire front. Barriers such as roads and canals had minimum effort in stopping the fire. By approximately 3 PM the fire had moved through several of these subdivided blocks northward nearly 3 miles. The fire was confined primarily to three of these blocks and had divided into 3 separate head fires (prongs). The two outside "heads" on east and west side progressed approximately 1/2 mile ahead or north of the middle headfire (prong) due to the effects of roads and canals in the subdivisions.

It was about this time that the tractor plow unit left the road approximately 1/2 mile in front of the head of the center prong. The tractor had just moved into the woods when Mr. Frank Smith, who was on the road experienced hot, dry, rushing wind which probably marked the beginning of the fire blow-up, primarily created by the effect of the outside fire heads pulling or sucking the middle head forward and further accelerated by the increasing vertical smoke column lift increased fire intensity, and increased preheating of fuels in advance of the fire. The fire advanced forward approximately 1/2 mile to the tractor unit in 2-3 minutes.

The extreme fire behavior was further evidenced by Wayne Young, Ranger Supervisor who was on the west flank and described the violent winds pulling debris into the building smoke column, loud noise of the fire "like a freight train" the wave-like action of the advancing fire and the long flame lengths.

The fire intensity was significantly greater near the accident, which was in the middle prong. All woody stems or leaves and vines were burned out of the trees. The force of the wind created from the blow-up had blown down several small cypress trees in advance of the fire. The fire intensity and forward rate of spread reduced significantly after the middle fire caught up, jumped the highway and moved into new blocks. Other observations made were reports of 2 or 3 other minor burning injuries that occurred about this time on the fire perimeter. The Division of Forestry aerial observer also experienced severe turbulence in his aircraft near the smoke plume.

Rates of Spread and Fire Intensity

Estimations for calculating rates of spread were done using fire model keys and fire behavior tables developed by Albini in 1976 and as shown in the NWCC Fireline Handbook.

The fuel models selected were model #7, Palmetto Gallberry under Southern Pine and model #4, Brush and Cabbage Palm. Because of the length of time the fire progressed and related weather changes calculations were made for two periods on the fire as shown on calculation forms. Each of the first types represented approximately one-half of the total fuels.

The only information available for winds aloft from the Weather Service taken at Miami at 1300 hrs.

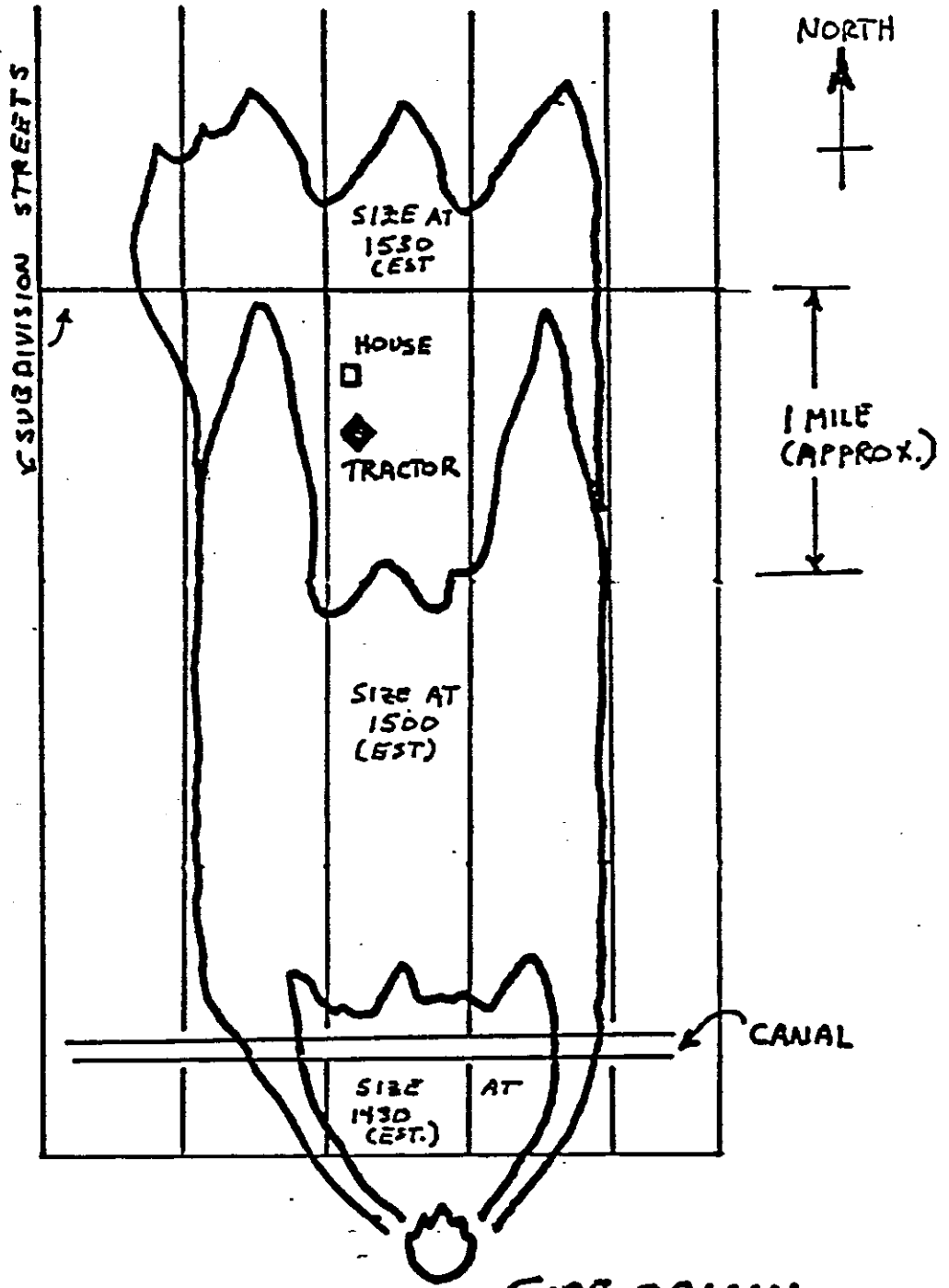
1,000' - SE 17 Kts	6,000' - W 19 Kts
2,000' - SE 14 Kts	8,000' - WNW 34 Kts
3,000' - S 11 Kts	10,000' - WNW 41 Kts
4,000' - SSW 16 Kts	

The average Rate of Spread for the fire up to time of accident was approximately 75 chains per hour. With average fireline intensity of 3,000 BTU/ft./sec., average flame lengths of 15 ft. accompanied with torching, quick short runs and spot fires starting in advance of head fires.

During the fire blow-up at approximately 1500 hours and at the time of the accident it was estimated the fire was moving 20-25 chains per minute with flame lengths of 75 and estimated fire intensity of 72,000 BTU/ft./sec. These calculations are somewhat verified by Frank Smith, Division employee who said, "it took only 2 or 3 minutes for fire to reach point where tractor was from start of blow-up approximately 1/2 mile to the south." This is documented by his statement that "he could not back up his truck fast enough to out-run the fire," so he decided to go forward as it rushed past.

From the above report, below are the major factors contributing to the extreme fire behavior and eventual blow-up:

- a) Drought conditions
- b) Recent freeze killing and curring live vegetation increasing fuel loading
- c) Relatively high temperature accompanied with low relative humidity
- d) Moderate wind speed
- e) Uneven advance of the head of fire caused by road network in the subdivision blocks which eventually caused the fire to separate into 3 separate parralleling head fires and then pull together when the outside heads outran the center head
- f) Vertical lift created by the blow-up which accelerated the fire intensity



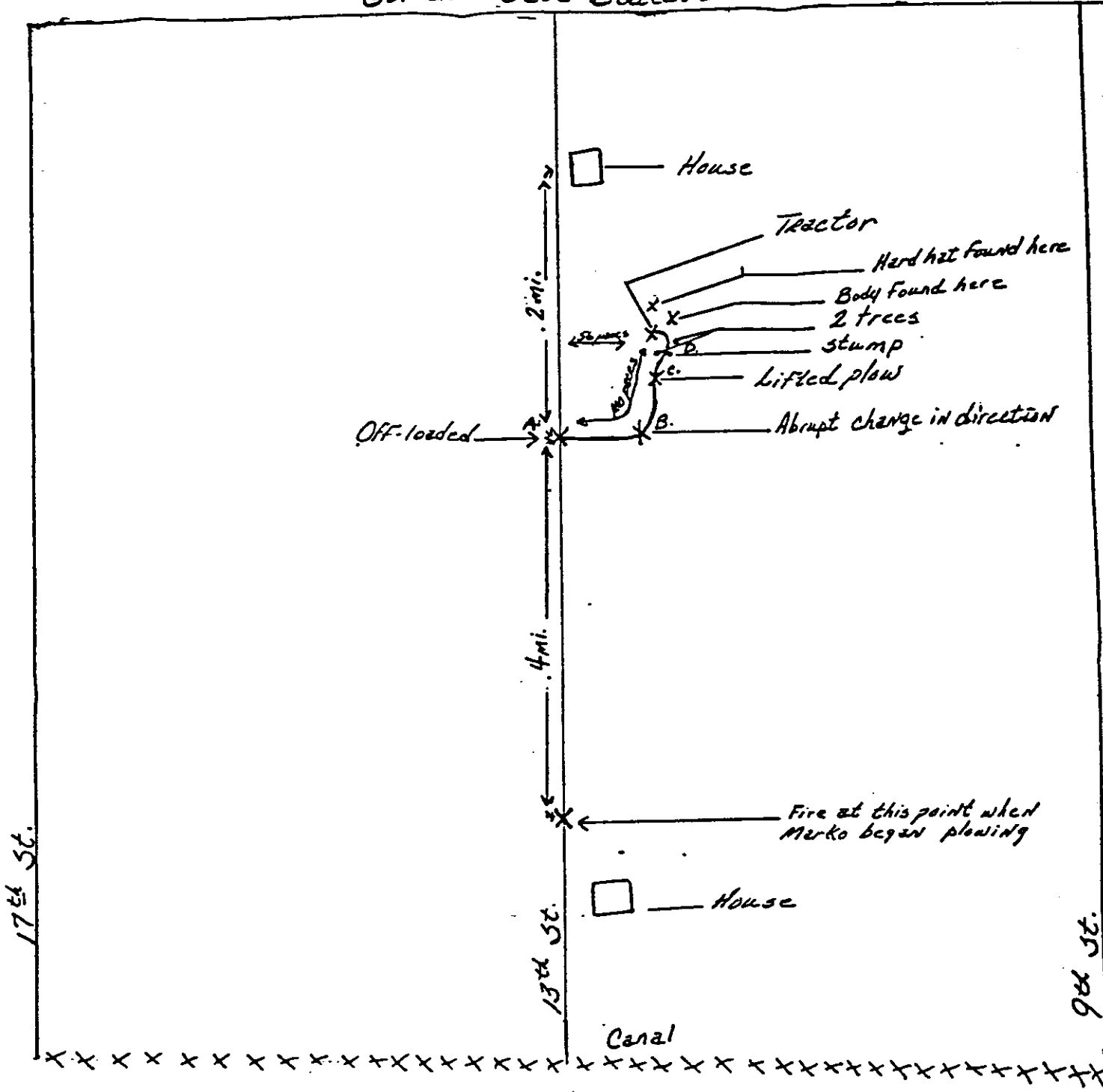
JANUARY 30, 1985
 GOLDEN GATE FIRE GROWTH (ESTIMATED)

Victim's Probable Actions

1. Off loaded on road (13 St.)
2. Crossed road shoulder and berm in easterly direction
3. Begin plowing approximately 30' from road edge
4. Made abrupt change in direction of travel toward northeast
5. Plowed erratically approximately 200'
6. Lifted plow
7. Proceeded approximately 17', came in contact with small palmetto stump and 2 cypress trees
8. Probably became stumped (forward movements stopped) for a short period of time.
9. Down shifted tractor to second gear and dislodged from stump and trees.
10. Proceeded approximately a tractor length as he attempted a turn to left toward road.
11. Tractor apparently stalled - due to oxygen starvation. Operator disengaged master clutch. Fire apparently ran victim from tractor at this point.
12. Exited tractor to right. Hard hat was apparently thrown or blown by wind from off head about 11'.
13. Victim moved to rear of tractor and fell backward face up. Victim landed with head 9' from tractor cab.



Golden Gate Boulevard



1 square = 1 MILE

- A. Off-loaded tractor
- B. Abrupt change in direction
- C. Lifted plow
- D. two trees and stump
- E. Tractor