Big Turnaround and Georgia Bay Complexes

Fire Behavior Assessment Report

Fire burning through site #7, a 20-year old slash pine plantation

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Executive Summary

Introduction

Wildfire suppression and wildland fire use fire management are dependent upon good fire behavior and resource effects predictions. Existing fire behavior and resource effects prediction models are based upon limited data from fire in the field, especially quantitative data. The Fire Behavior Assessment Team (FBAT) collects data to improve our ability to predict fire behavior and resource effects in the long-term and provides short-term intelligence to the wildland fire use managers and wildfire incident management teams on fire behavior-fuel and effects relationships. Increasing our knowledge of fire behavior is also important to fire fighter safety – the more we know the more we can mitigate hazards and prevent accidents. The team also collects other information on fire fighter safety, such as convective heat in safety zones as opportunities arise.

This report summarizes the results of the assessment of fire behavior in relation to fuels, weather and topography, and fire effects to resources in relation to fire behavior for the Big Turnaround Complex and Georgia Bay Complex (Sweatfarm Branch) fire incidents in Georgia during 2007.

Objectives

Our objectives were to characterize fire behavior in relation to fuels and weather for a variety of fuel conditions. A key consideration was which sites could be measured safely given access and current fire conditions.

Accomplishments

Fire behavior, pre-fire fuels and post-fire conditions were measured at 13 sites including a variety of conditions. Fuel types included native slash pine, slash pine plantations, pond pine-sweet bay and pocosin. Two of the native slash pine sites had been treated with prescribed fire last year (2006).

Introduction

Introduction

Wildfire suppression and wildland fire use fire management are dependent upon good fire behavior and resource effects predictions. Existing fire behavior and resource effects prediction models are based upon limited data from fire in the field, especially quantitative data. It is difficult to accurately predict fire behavior in the outside environment based upon laboratory data, limited experimental data on prescribed burns or broad field observations. The Fire Behavior Assessment Team (FBAT) collects data to improve our ability to predict fire behavior and resource effects in the long-term and provides short-term intelligence to the wildland fire use managers and wildfire incident management teams on fire behavior-fuel and effects relationships. Increasing our knowledge of fire behavior is also important to fire fighter safety – the more we know the more we can mitigate hazards and prevent accidents. The team also collects other information on fire fighter safety, such as convective heat in safety zones as opportunities arise. (See Appendix A for information on the Fire Behavior Assessment Team).

This report contains the results of the assessment of fire behavior in relation to fuels and weather, and immediate fire effects in relation to fire behavior for the Georgia Bay Complex (Sweatfarm Branch) and Big Turnaround Complex fire incidents in Georgia during 2007.

Objectives

Our objectives were to characterize fire behavior in relation to fuels and weather for a variety of conditions, in particular age of stand and areas that had been treated with prescribed fire. A key consideration was which sites could be measured safely given access and current fire conditions.

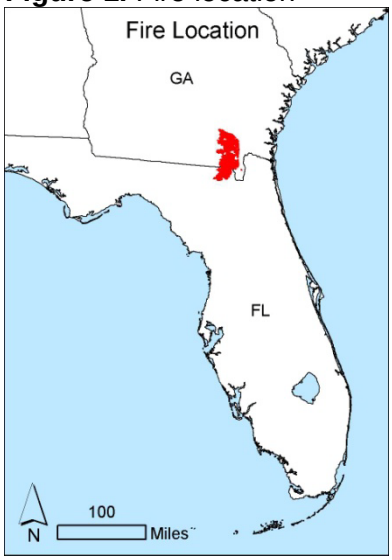
Applications

The information will be shared with firefighters to improve situational awareness, managers to improve predictions for fire planning, and scientists for improving fire behavior models.

Approach

Pre- and post-fire fuels and fire behavior measurements were made at sites throughout the fire (Figure 1). Sites were selected to represent a variety of fire behavior and vegetation or fuel conditions. Priority was on sites that would most likely receive fire. A rapid assessment of fire severity and effects was conducted across the portions of the fire that had burned.

Figure 1. Fire location



Fire Behavior Measurements and Observations

At each site sensors were set up to gather information on fire behavior including: rate of spread, fire type, flame length, and flaming duration. Temperature was also measured at most sites.

Flame Length and Flaming Duration

Flame length was determined from video and sometimes supplemented by tree height or char height. If crown fire behavior occurred above the view of the camera, then tree height was used to estimate the minimum flame length for that period of burning. Flaming duration was based on direct video observation and when temperature was measured, data from those sensors was utilized as well.

Figure 2. Installing fire behavior sensors at one of sites.

Fire Type

Fire type was determined from video as well as post-fire effects at each site. Sites where there was complete consumption of needles in the crowns then fire type was classified as crown fire.

Rate of Spread and Temperature

Rate of spread was determined by video analysis and rate of spread sensors (Delta Sigma Tech. 2005). Two models of rate of spread sensors were used, one is a time stamp that that records the date and time when the solder melts which is attached to a computer chip (buried in the ground). In addition, on most sites, thermocouples attached to Campbell Scientific data loggers were also used for rate of spread that measure ongoing temperature data streams at incremental vertical levels at the surface level and above. The distance and angle between rate of spread sensors or thermocouples were measured and the Simard (1982) method of estimating rate of spread using applied trigonometry.

Vegetation and Fuel Measurements

Vegetation and fuels were inventoried before the fire reached each site and then remeasured after smoldering had stopped. Consumption and fire effects (i.e. scorch) were inventoried after burning. Mortality was not determined for trees, since mortality can be delayed for some time after the fire, and is not possible to determine immediately post-fire.

Crown Fuels and Overstory Vegetation Structure

Tree density, basal area, diameters, height and canopy base height were measured by species for each site. A relaskop was used for overstory and pole size tree plots. Heights were measured with an impulse laser. Diameters were measured with a biltmore stick. The Fire Management Analyst program (Carleton 2005) was used to

calculate canopy bulk density, canopy base height, tree density and basal based on each plot's measurements.

Woody fuels were measured along a 50-foot transect at each site, in view of one of the video cameras. Litter and duff depths were measured along the transects as well. Litter and duff weights were calculated using Ottmar and Andreu (2007). Understory vegetation cover by species was ocularly estimated in a 1 meter wide belt along the transect. Representative height of each species was recorded to the nearest centimeter. Several different approaches were used to calculate live understory fuel loading including regressions by Hough and Albini (1978), a look-up table by Edwards and McNab (1976), and photo series by Ottmar et al. (2000).

Foliar Moisture and Weather

Foliar moistures for dominant species were obtained from the Florida Division of Forestry website (http://www.fl-dof.com/wildfire/live_fuel_moisture/index.html). The data was posted 5/19/07 (Table 6). Weather data was downloaded from two remote automated weather stations (RAWS) located in southern Georgia, called the Tower and Perimeter Stations, and reprinted here for the times that the study sites burned (Tables 7a&7b).

Findings

Overall

Fire behavior and post-fire data were collected at 11 sites that burned. Two monitored sites did not burn. One was displaced by tractor and helicopter operations. To summarize the data sites were grouped by dominant vegetation types and whether they had recently been prescribed burned (Table 1). The five vegetation types sampled included:

- natural slash pine (3 sites) of which two had been recently burned and are red cockaded woodpecker habitat,
- pond pine (2 sites),
- open pond pine-swamp (1 site),
- slash pine plantations (7 sites, 5 burned)

Within the slash pine plantation type, various age stands were sampled including four that were an estimated 20 years old, one an estimated 15 years old, and two that were 5 to 10 years old that did not burn. Plantation age was estimated based on stand height and diameter and discussion with local foresters.

A variety of fire behavior was measured across the sites, although most was high intensity because of the drought conditions that preceded the fire. All but three of the sites that burned were during free-burning or untrammeled wildfire. The remaining three burned as part of fire suppression burnout operations (Table 8). Crown fire was evident on two sites but most burned as high intensity surface fires.

Table 1. Vegetation types assigned to each site and used to group data.

Site	Site Description	Location and Type of Burn
	open pond pine (swamp)	
2	Dense shrub field 4ft tall with gallberry, lyonia and *Smilax* (greenbrier) species. Spongy floor with some standing water under the moss. Burned in a wildfire in 2001.	Big Turnaround Complex, burn operation
	pond pine	
1,3	Overstory of pond pine with dense midstory, inc. sweetbay. Understory of sweetbay, gallberry and lyonia.	
	natural slash pine (swamp)	Georgia Bay Complex, wildfire
11	Natural stand of native slash pine and yaupon. Lots of grass, rush, and sporangium moss on forest floor.	
	natural slash pine - recent prescribed fire	
12,13	Late mature slash pine stand, recently burned (1-2 years ago). Woodpecker (RCW) habitat with understory of palmetto, bracken fern, sweetbay, and *Vaccinium* (blueberry) species.	
	slash pine plantation	Georgia Bay Complex, site did not burn
4, 6	5-10 year old slash pine plantation, with high grass (*Agropogon* species) cover and scattered gallberry and *Vaccinium* species.	
5	15 year old plantation of slash pine, sparse palmetto and gallberry in the understory.	Georgia Bay Complex, wildfire
7,8,9	20 year old slash pine plantation, heavy needle cast on understory of various mixtures of greenbrier, palmetto, gallberry, and redbay.	
10	20 year old slash pine plantation, moderate overstory with dense understory of gallberry with heavy needlecast.	

Vegetation, Fuels, Fire Behavior and Effects

Data on pre-fire vegetation structure (tables 2 and 3), pre-fire live fuels (table 4), pre-fire surface fuels (table 5), fire behavior (table 6), post-fire consumption of surface fuels (table 7) and immediate post-fire effects (table 8) were summarized.

Pre-fire Vegetation Structure and Fuels

Vegetation and fuels varied amongst the sites (Tables 2, 3, 4, 5).

Table 2. Canopy cover by life form by site. Canopy cover is based on ocular estimates of cover classes. Classes were: <1%, 1-10%, 10-25%, 25-50%, 50-75%, >75%.

	Canopy Cover by Life Form (%)				
Site	**tree**	**shrub/palmetto**	**Sedge/Grass**	**Fern/Herb**	**Moss**
open pond pine (swamp)					
2	0	90-100	0	5	90
pond pine					
3	10-30	75	0	0	0
1	80	80	0	0	0
natural slash pine (swamp)					
11	10-15	20-25	90-100	0	20
natural slash pine - recent prescribed fire					
12	25-30	90-100	3	1	0
13	20	90-100	30	1	0
slash pine plantation					
6	5-10	40-50	75	5	3
4	40-50	40-50	80	5	0
5	80	10-15	0	0	0
7	70	20-30	0	1	0
8	0	10	0	0	0
9	70	40-50	10	0	0
10	35	80-90	0	0	0

Table 3. Pre-fire forest structure calculated using Fire Management Analyst (FMA, Carlton 2005).

		Conifers only[1]				Conifers and Hardwoods[2]		
Site	Basal Area (ft^2/ac)	Average Stand Height (ft)	Canopy Ceiling Height (ft)	Canopy Bulk Density (kg/m^3)	Canopy Base Height $(ft)^3$	Average Stand Height (ft)	Canopy Ceiling Height (ft)	Canopy Bulk Density (kg/m^3)
open pond pine (swamp)								
2	0	0	0	0.000	0	0	0	0.000
pond pine								
3	130	50	68	0.037	13	50	68	0.072
1[4]	170	60	80	*	*	53	80	*
natural slash pine (swamp)								
11	40	40	40	0.013	26	14	40	0.047
natural slash pine - recent prescribed fire								
12	50	67	76	0.032	39	67	76	0.032
13	55	63	73	0.035	33	63	73	0.035
slash pine plantation								
6	30	12	11	0.008	5	11	12	0.019
4	50	18	23	0.022	8	18	23	0.022
5	190	34	52	0.127	21	34	52	0.127
7	180	53	62	0.176	33	53	62	0.176
8	135	55	61	0.125	36	27	61	0.125
9	100	30	38	0.064	16	30	38	0.064
10	100	52	58	0.079	29	52	58	0.079

[1]Standard FMA run where hardwoods are not counted in crown fuel calculations.
[2]FMA run with hardwoods included; tanoak equations were used since no southern hardwoodspecies were available.
[3]Canopy base height including conifers only (FMA)
[4]Relaskop malfunctioned, basal area estimated, other canopy fuel data not available.

Table 4. Shrub and palmetto fuel loading by site. Calculated from algorithms in the below listed literature based on measurements of cover, height and age of stand.

Shrub and Palmetto Loading (tons/ac)					
Site	**Hough-Albini with palmetto[1]**	**Hough-Albini with all shrubs[2]**	**Age of rough vs. height[3]**	**photo series[4]**	**Shrub Height (ft)**
open pond pine (swamp)					
2	*	*	3	10	3.3
pond pine					
3	2.0	2.2	7.3	n/a	5.1
1	*	*	10	n/a	6.3
natural slash pine (swamp)					
11	7.4	7.5	>15	n/a	10.4
natural slash pine, recently burned					
12	0.9	0.9	0.5	1.2	1.3
13	0.7	0.7	0.4	1.2	1.9
slash pine plantations					
5	*	*	10.2	3	3.1
7	3.1	3.1	10.2	4.5	5.6
8	2.6	2.6	10.8	4.5	4.9
9	2.2	2.8	8.3	4.5	3.9
10	5.1	5.0	10.8	4.5	5.4

[1]Computed using regressions in Hough and Albini (1978), with palmetto cover for understory only.
[2]Computed as in #1 but using all understory shrub and palmetto cover.
[3]Computed using table from Edwards and McNab (1976).
[4]Estimated from Ottmar et al. (2000) photo series.

Table 5. Litter and duff pre- and post-fire. Calculated from litter and duff depths using bulk densities from Ottmar and Andreu (2007).

Pre- and post fire litter and duff loading										
Pre-fire					Post-fire				Consumption (%)	
Site	Litter Depth (in)	Duff Depth (in)	Litter Weight (tons/ac)	Duff Weight (tons/ac)	Litter Depth (in)	Duff Depth (in)	Litter Weight (tons/ac)	Duff Weight (tons/ac)	Litter	Duff
open pond pine (swamp)										
2	3.0	4.7	4.1	22.9	0.2	4.7	0.3	22.9	93	0
pond pine										
3	2.2	2.7	4.1	16.6	1.6	2.7	3.0	16.6	27	0
1	2.9	4.9	5.4	30.8	1.5	4.8	2.8	30.1	48	2
natural slash pine (swamp)										
11	*	*	*	*	*	*	*	*	*	*
12	0.8	1.0	1.7	6.8	0.0	0.4	0.0	2.7	100	60
13	0.9	0.8	1.9	5.4	0.0	0.4	0.0	2.7	100	50
slash pine plantation										
6	*unburned*									
4	4.3	0.6	9.4	4.1	*unburned*					
5	*(Plot was abandoned before data was collected because of fire activity.)*									
7	2.0	0.6	4.3	4.1	0.0	0.6	0.0	4.1	100	0
8	0.9	0.6	1.9	4.1	0.0	1.0	0.0	4.1	100	0
9	1.3	0.8	2.8	5.4	0.0	0.8	0.0	5.4	100	0
10	4.8	0.7	10.5	4.7	0.0	0.7	0.0	4.7	100	0

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Weather and Fuel Moisture

Foliar moistures varied from 40-46% for wiregrass to 136 for slash pine. Gallberry was reported at 115 to 120% moisture, and saw palmetto from 104 to 109%.

Table 6. Foliar moisture from Florida Division of Forestry website (http://fkane,fk-dof.com/lfm/current_lfm.html). The data was posted 5/19/07.

Foliar moisture			
		Foliar Moisture (%)	
District	**Species**	mean	standard error
Tallahassee	Wiregrass	46	7
	Gallberry	119	4
	Slash Pine	136	2
	Chalky Bluestem Grass	90	5
	Black Titi	176	2
	Saw Palmetto	109	1
Jacksonville	Wiregrass	40	5
	Gallberry	117	1
	Saw Palmetto	104	3
	Fetterbush	93	7
	Loblolly Bay	137	4
	Runner Oak	80	4

Table 7a. Summary of weather data from the Tower remote area weather station (RAWS) during the times when sites burned.

Summary of weather data – Tower RAWS									
Site Information			Tower Weather Station Data During Site Burns						
Site	Date burned	Time burned, EST (hour:min:sec)	Date and time (EST)	Average temperature (°F)	Dew point temperature (°F)	Relative humidity (%)	Average winds (mph)	Wind gusts (mph)	Wind direction (degrees)
open pond pine (swamp)									
			5-22-2007 18:31	81	58	45	3	11	145
2	5/22/2007	18:24:33	5-22-2007 17:31	82	56	41	4	14	120
pond pine									
			5-23-2007 15:31	86	62	44	3	19	263
3	5/23/2007	14:56:17	5-23-2007 14:31	87	64	46	3	16	271
1	5/23/2007	11:29:00	5-23-2007 11:31	80	63	56	3	12	148
natural slash pine (swamp)									
11	5/27/2007	0:13:51	5-27-2007 0:31	59	57	92	0	0	0
natural slash pine, recently burned									
12			5-27-2007 15:31	84	51	32	3	8	9
12	5/27/2007	14:51:45	5-27-2007 14:31	85	52	32	2	9	124
13			5-27-2007 15:31	84	51	32	3	8	9
13	5/27/2007	14:55:08	5-27-2007 14:31	85	52	32	2	9	124
slash pine plantation									
7			5-25-2007 14:31	83	57	41	3	10	112
7	5/25/2007	14:04:13	5-25-2007 13:31	82	59	45	2	13	354
8			5-25-2007 14:31	83	57	41	3	10	112
8	5/25/2007	14:17:12	5-25-2007 13:31	82	59	45	2	13	354
9			5-25-2007 17:31	83	59	45	3	14	72
9	5/25/2007	17:10:25	5-25-2007 16:31	82	58	44	2	15	63
10			5-26-2007 16:31	85	55	36	3	8	134
10	5/26/2007	15:45:19	5-26-2007 15:31	86	52	31	1	10	104

Table 7b. Summary of weather data from the Perimeter remote area weather station (RAWS) during the times when sites burned.

Summary of weather data – Perimeter RAWS									
Site Information			Perimeter Weather Station Data During Site Burns						
Site	Date burned	Time burned, EST (hour:min:sec)	Date and time (EST)	Average temperature (°F)	Dew point temperature (°F)	Relative humidity (%)	Average winds (mph)	Wind gusts (mph)	Wind direction (degrees)
open pond pine (swamp)									
			5-22-2007 18:29	80	57	45	6	16	104
2	5/22/2007	18:24:33	5-22-2007 18:29	80	57	45	6	16	104
pond pine									
			5-23-2007 15:29	86	59	40	7	22	83
3	5/23/2007	14:56:17	5-23-2007 14:29	84	60	45	6	20	90
1	5/23/2007	11:29:00	5-23-2007 11:29	81	63	55	4	13	94
natural slash pine (swamp)									
11	5/27/2007	0:13:51	5-27-2007 0:29	61	58	90	0	2	335
natural slash, recently burn									
			5-27-2007 15:29	86	54	34	4	13	285
12	5/27/2007	14:51:45	5-27-2007 14:29	87	50	28	4	16	63
			5-27-2007 15:29	86	54	34	4	13	285
13	5/27/2007	14:55:08	5-27-2007 14:29	87	50	28	4	16	63
slash pine plantation									
			5-25-2007 14:29	84	56	38	6	14	68
7	5/25/2007	14:04:13	5-25-2007 13:29	82	60	47	5	15	109
			5-25-2007 14:29	84	56	38	6	14	68
8	5/25/2007	14:17:12	5-25-2007 13:29	82	60	47	5	15	109
			5-25-2007 17:29	81	57	44	5	17	91
9	5/25/2007	17:10:25	5-25-2007 16:29	83	59	44	5	13	89
			5-26-2007 16:29	87	53	31	5	13	92
10	5/26/2007	15:45:19	5-26-2007 15:29	87	53	31	5	12	115

Fire Behavior and Fire Effects

The descriptions of fire behavior and effects below were based on an initial rapid assessment. Videos were preliminary assessed visually, and the estimates might change in the future with more detailed digital analysis of the imagery.

Pocosin (site 2)

Site 2 burned as a low intensity surface fire with flame lengths estimated at 5' from the video (Figure 3). Fuel consumption on this shrubby site was nearly 100%, with stems reduced to less than 1inch in height.

Figure 3. Fire burning toward site 2 (left photo) and then fire in the site (right photo).

Pond Pine-Sweet Bay (Sites 1 and 3)

Both sites 1 and 3 burned as part of a suppression burnout operation. At site 1, the fire burned as a low intensity surface fire that backed through the site. Flame lengths were estimated at 1 foot from the video (Figure 5). There was no crown scorch or consumption (torch), but high consumption of understory shrubs. Remaining stems were reduced to less than 5 inches in height. Site 3, also burned as a low intensity surface fire, with flame lengths estimated at 4 feet from the video (Figure 4). There was little crown scorch in the overstory tree layer, but midstory trees had heavy (75%) to complete (100%) scorch. In the understory, there was heavy scorch and moderate to high, but not complete, consumption.

Figure 4. Fire burning through site 3 (photo on left) and later lingering combustion (photo on right).

Figure 5. Fire burning through site 1 (left photo) and post-fire at the same site (right photo).

Natural Slash Pine Stands (Sites 11, 12, 13)

These sites burned as low, moderate and high intensity surface fires. Site 11 burned as a low intensity surface fire at night. Flame lengths were estimated at 1 foot from the video, with very slow rates of spread at less than 1 chain per hour (Figure 6). Understory shrubs were scorched but with little consumption. The dense layer of sedges in the understory was almost totally consumed but the underlying moss had little change.

Sites 12 and 13 burned as moderate to high intensity surface fires during the day (Figures 7 and 8). Site 12 burned partially as a backing fire but site 13 burned as a head fire. Flame lengths at site 12 were estimated at 6 feet from the video. At site13 flame lengths were estimated at 15' from the video. Neither of the stands had overstory crown consumption. Site 12 had moderate to high crown scorch (60-95%) and site 13 high crown scorch (100%). At both sites there was heavy consumption of the understory with only stobs of shrubs and stems of palmetto remaining.

Figure 6. Site 11 burning at night.

Figure 7. Fire burning toward site 13.

Figure 8. Low intensity flanking fire (left photo) and head fire (right photo) in site 12.

Slash Pine Plantations (Sites 5, 7, 8, 9, 10)

Three of the pine plantation sites burned as high intensity surface fires (sites 7, 8, 9) and two as crown fires. Site 5 exhibited crown fire (all crowns consumed, Figures 9 and 10). Site 10 had extensive torching (half of trees in plot had crowns consumed). Flame lengths at the sites that burned as high intensity surface fires (sites 7, 8, 9) were estimated at between 7-12 feet (Figures 11 and 12). Site 7 burned with the greatest rate of spread (estimated at 60 chains per hour from the video, and 30 to 115 chains per hour from sensors) and had no overstory tree crown scorch. Sites 8 and 9 burned with slower spread rates (estimated 4-7 chains per hour from video).

Figure 9. Spots starting in site 5 (left photo) and coalescing (right photo).

Figure 10. After spots have coalesced and merged with main head fire at site 5.

Figure 11. Fire burning through site 8.

Figure 12. Fire burning in site 7 (left photo) and site 9 (right photo).

Table 8. Fire behavior measurements and observations by site. Note site 4 and 6 did not burn.

Fire Behavior					
Site	**Fire Type**	**Flame length (feet)**	**Rate of Spread (chains/hr)**	**Flame Duration across site (from video)**	**Temperature (^{0} F)**
open pond pine (swamp)					
2	low intensity surface head fire (firing operation)	5	0.07 to 2	1 min.	1890
pond pine					
3	low intensity surface backing fire (firing operation)	4	0.08 to 3	4.5 min.	389
1	low intensity surface backing fire (firing operation)	1	0.03 to 6	41 min.	not measured
natural slash pine (swamp)					
11	night time, mainly low intensity surface fire flanking and backing	1	0.16 to 3	1 hr 11min.	not measured
12	moderate intensity surface flanking fire and also head fire (initially flanking/ backing then head fire came from behind camera)	6	0.05 to 5	17 min.	1555
13	high intensity surface head fire	15	30 to 278	3 min.	1677
slash pine plantation					
5	Spot fires in front of camera that coalesced with a head fire and turned into a crown fire	Above view of camera, above trees (>50)	Abandoned site before sensors placed, video difficult to interpret	21 min.	not measured
7	high intensity surface head fire	7	29 to 115	9 min.	1542
8	high intensity surface flanking fire	7	4 to 194	22 min.	1857
9	high intensity surface fire, both backing & head fire that met in view of camera	10	0.05 to 4	9 min.	1584
10	high intensity surface fire with extensive torching (50% of trees)	20 +	8 to 18	40 min.	not measured

Post-fire Consumption and Immediate Effects

The fire effects were measured and observed post-fire, immediately after consumption ended. The effects reported here included dead fuel consumption, crown scorch and consumption by vegetation layer (overstory tree, midstory tree, shrub, grass) and changes in soil color and cover (Tables 5, 9, 10). It was not possible to determine tree mortality or mortality of understory plants that may resprout so soon after the fire.

Table 9. Soil severity rating (USDI National Park Service 2001).

Soil severity rating					
Site	**Very high (1)**	**High (2)**	**Moderate (3)**	**Low (4)**	**Unburned (5)**
(% of site)					
open pond pine (swamp)					
2			100%		
pond pine					
3			85%	15%	
1			25%	75%	
natural slash pine (swamp)					
11		5%	35%	45%	5%
natural slash pine - recent prescribed fire					
12		95%			5%
13		95%			5%
slash pine plantation					
6	*Site disrupted by tractor*				
4					
5	10%	85%	5%		
7	5%	80%	5%		
8			5%	75%	15%
9		100%			
10	75%	25%			

1- very high, white ash, some discoloration of soil; 2 – high, gray and black ash;
3 – moderate, ash and some patches of charred litter or duff;
4 – low severity, charred litter and some unburned litter and duff remain;
5 – unburned.

Table 10. Summary of immediate post fire effects per site. Mortality was not included, since survival would not be determined immediately post-fire. Trees that were scorched can survive. Data below lists **torch, where needles are consumed**, and **scorch, where needles are brown** but not consumed. Results below were based upon a rapid analysis of measured crown scorch and torch. Detailed data by individual tree was recorded but was not summarized quantitatively at this time.

Summary of immediate post fire effects								
	Understory			Midstory Trees		Overstory Trees		
Site	Grass/herb /ferns/moss	Shrubs	Tree seedlings	Scorch (% crown)	Torch (% crown)	Scorch (% crown)	Torch (% crown)	Mean char height (feet)
open pond pine (swamp)								
2	100% cons. ferns, moss little affected	100% cons. leaves and some stems	100% foliage consumption for singe pond pine					
pond pine								
3	none in plot	75-100% scorch and 20-90% cons.	100% scorch	75-100	0-100	mostly 0, few 5-10	0	0-10
1	none in plot	100% scorch, 20-80% cons. leaves and some stems	n/a	0	0	0	0	3-5
natural slash pine (swamp)								
11	95-100% grass consumption, moss consumption <20%	100% scorch and 20% consumption	n/a	10-50	0	0	0	1-6
natural slash pine - recent prescribed fire								
12	100% consumption	90% consumption	n/a	n/a	0	60-95	0	6-9
13	100% consumption	90% consumption	n/a	100	0	100	0	3-25
slash pine plantation								
5	n/a	100% cons. leaves and 90-100% stems	n/a	100	100	100	100	13-52
7	n/a	100% cons. foliage and 50% stems	100% consumed (red maple)	0	0	0	0	12-20
8	n/a	90-100% consumption	100% consumed (red maple)	60-100	half 0, half 50-100	30-100	0	6-36
9	100% consumption of grass	90-100% consumption	none in plot	40-90	0	30 & 100	0	9-20
10	n/a	98-100% consumption	none in plot	75-100	half <15, half 100	30-100	half 0, half 100	36-60

Detailed pre- and post-fire photos grouped by vegetation type

Open pond pine-swamp (Site 2)

Pond Pine (Sites 1 and 3, presented in that order)

Natural Slash Pine (Sites 11, 12, 13, presented in that order)


29 6:35 AM


29 7:23 AM

Slash Pine Plantations (Sites 5, 7, 8, 9, 10, presented in that order)

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Appendix A. About the Fire Behavior Assessment Team

We are a unique module that specializes in measuring fire behavior on active fires of all kinds including wildland fire use fires, prescribed fires or wildfires. We utilize fire behavior sensors and special video camera set-ups to measure direction and variation in rate of spread, fire type (e.g. surface, passive or active crown fire behavior) in relation to fuel loading and configuration, topography, fuel moisture, weather and operations. We measure changes in fuels from the fire and can compare the effectiveness of past fuel treatments or fires on fire behavior and effects. We are prepared to process and report data while on the incident, which makes the information immediately applicable for verifying LTAN or FBAN fire behavior prediction assumptions. In addition, the video and data are useful for conveying specific information to the public, line officers and others. We can also collect and analyze data to meet longer term management needs such as verifying or testing fire behavior modeling assumptions for fire management plans, unit resource management plans or project plans.

We are team of fireline qualified technical specialists and experienced fire overhead. The overhead personnel includes a minimum of crew boss and more often one or more division supervisor qualified persons. The team can vary in size, depending upon availability and needs of order, from 5 to 12 persons. We have extensive experience in fire behavior measurements during wildfires, wildland fire use fires and prescribed fires, having worked safely and effectively with over 16 incident management teams.

We can be ordered from ROSS and can reach us through Tahoe NF dispatch, 530-478-6111. Do not assume that we are not available if you call dispatch and we are already on a fire. We have and can work more than one fire simultaneously and may be ready for remobilization.