

FIRE CONTROL NOTES

DECEMBER 6, 1937

Forestry cannot restore the American heritage of natural resources if the appalling wastage by fire continues. This publication will serve as a channel through which creative developments in management and technology may flow to and from every worker in the field of forest fire control.

CORRELATION OF REGIONAL FIRE DANGER RATING SYSTEMS

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The pioneering of Gisborne and Shank has led to active interest in all Regions in the development of reliable devices for measuring and integrating the elements of fire danger. Without the aid of such devices a manager of fire control lacks command of facts which are essential to successful performance of his function. But much of the value of such devices will be lost unless they are so related to each other that fire danger can be correlated and compared for different types of country and different combinations of fire danger factors. In most Regions and for the country as a whole we now rate fire days as easy, normal, or bad. Human nature being what it is, our easy periods tend to be rated as normal, our normal ones as bad, and our really bad ones fail to be recognized as such. In a stimulating way the author discusses possible means of putting this sort of loose thinking behind us. With good response from other students of the subject our mastery of this problem should be speeded up.

The numerical system of rating fire danger¹ as originated by Gisborne in Region 1 has proved to be such a valuable aid to presuppression and suppression that all Forest Service Regions in the United States are committed to the development of danger rating schemes. Such schemes are useful in determining the number and distribution of men needed for effective fire control from day to day as fire danger fluctuates.

Not only is the daily rating of fire danger valuable, but administrators who wish to rate the relative efficiency of several fire control units or of any one unit for several years also find expressions of the severity of the entire fire season essential. Quality of fire control can be accurately rated only if statistics of number of fires, area burned, and cost are compared with ignitibility and combustibility of fuels as measured and expressed numerically.

¹In this discussion, "fire danger" expresses the total of all temporary dangers that affect ignition and combustion; that is, abnormal occurrence, fuel condition, and weather.

THE HANDLING OF THE BLACKWATER FIRE

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As soon as the news of the Blackwater Fire on the Shoshone National Forest was received in Washington, action was taken to investigate the circumstances of the tragedy. This article is a transcript of that portion of the investigative report of David P. Godwin dealing mainly with the organization and the attack.

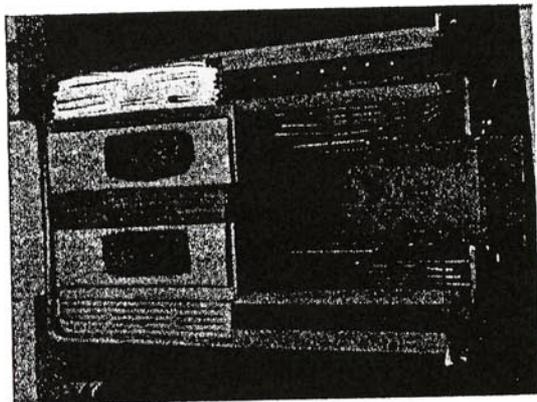
1. *The Cause*—An electrical storm had occurred in the general vicinity of Blackwater Creek on Wednesday, August 18. The fire when seen from the air by Assistant Supervisor Krueger on August 20 appeared to be only about two acres in extent, and was in the creek bottom at a point indicated on the map.

A careful resurvey of the area on August 28 resulted in the discovery of the tree which had been struck. It was an alpine fir (*Abies lasiocarpa*) about 16 inches DBH, located on a low bench about 100 feet west of main Blackwater Creek. The tree was split to the ground and several large split slabs were scattered about the base. The ground litter at the base of the tree had evidently ignited at once. In the immediate vicinity the forest was fairly open, with little ground litter. The fire had evidently worked slowly uphill to the west and then with a change of the wind came down into the creek bottom, and later—on Friday—had started across the bottom and uphill in an easterly direction.

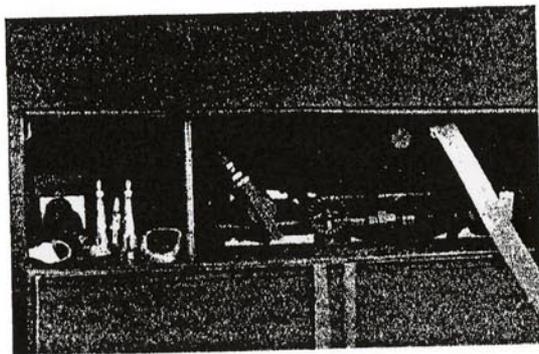
There was an unused trail (little more than a game trail) along the creek, but the first man to arrive found no indications of recent human use. There is no evidence whatever to indicate that the fire may have been man-caused.

2. *Reporting and Travel Time*—As shown in the chronological outline, the location of the fire was reported to District Ranger Fifield at the Wapiti Ranger Station at 3:45 p. m. Friday, August 20. At 3:52 p. m. he left for the fire, after having made his first call for the available men (20) then at the Wapiti CCC camp. En route he stopped at Blackwater Lodge, at the mouth of Blackwater Creek, and at 4:05 p. m. telephoned the Wapiti CCC camp for 50 more men (or all then available). He arrived at the fire at 5:10 p. m. This one hour and eighteen minutes is good travel time, considering the terrain, the stops made, and the fact that Fifield, being new in this district, was not thoroughly familiar with the territory. He had traveled 8 miles by highway, 3 miles by unused logging road, and 2 miles by unused trail.

The first crew (7 men and Foreman Bryan Sullivan of the Wapiti CCC



View from above, with seat cushions removed, showing tool compartments. Hose rack in front, with water tank underneath.



Close up of power take-off and pump

camp) arrived at the fire at 5:45 p. m. The second crew of 20 men from the Wapiti CCC camp arrived at 5:50 p. m. This latter crew had traveled 6 miles by highway, 3 miles by unused logging road, and 2 miles by unused trail.

By 8:00 p. m., Fifield had 58 enrollees and 7 overhead. The BPR camp, located about 3 miles up the highway from Blackwater Lodge, had been called upon at 10:30 p. m. to send a crew, but because none of the men were in camp it was not possible to get in touch with them until morning, and the crew of 9 men did not arrive at the fire until 10:00 a. m. Saturday, August 21.

The travel time on the whole was fair. With some crews it was very good. In the many later arrivals of CCC crews after Saturday noon the travel time was good. Consideration must be given to the fact that many of these movements were at night and over long distances, with need for stops. (See later discussion of travel time of the Tensleep crew.) The following is a statement of crews and their travel time:

Camp	No. Men	Time Called		Trav. Dist.	Time Arrived		
		Date	Hour		Date	Hour	
Wapiti.....	7	8/20	10	8/20	5:45 p.m.	(at fire)
Wapiti.....	22	8/20	4:05 p.m.	11	8/20	5:50 p.m.	"
Wapiti.....	15	8/20	4:05 p.m.	11	8/20	6:15 p.m.	"
Wapiti.....	7	8/20	4:05 p.m.	11	8/20	6:55 p.m.	"
Wapiti.....	7	8/20	4:05 p.m.	11	8/20	7:50 p.m.	"
Lake.....	54	8/20	8:00 p.m.	48	8/21	2:30 a.m.	At upper camp
BPR.....	9	8/20	10:30 p.m.	8	8/21	10:00 a.m.	" " "
Wapiti side camp.....	12	8/20	4:05 p.m.	76	8/21	10:00 a.m.	" " "
Tensleep.....	50	8/20	10:50 p.m.	182	8/21	12:15 p.m.	" " "
Deaver.....	50	8/21	1:30 a.m.	96	8/21	12:30 p.m.	" " "
Basin.....	51	8/21	9:00 a.m.	106	8/21	5:00 p.m.	" " "
Basin.....	33	8/21	106	8/21	11:00 p.m.	" " "
Worland.....	60	8/21	1:30 p.m.	137	8/22	1:00 a.m.	" " "
Thermopolis.....	64	8/21	3:45 p.m.	172	8/22	3:00 a.m.	" " "
Basin.....	20	8/21	3:45 p.m.	106	8/22	3:00 a.m.	" " "
Worland.....	24	8/21	3:45 p.m.	137	8/22	6:00 a.m.	" " "

Forest Supervisor Sieker's travel time, as with other unattached overhead, was especially good. He had left Sunlight Ranger Station at 4:30 p. m., had driven 43 miles to Cody and 48 miles from Cody to the lower fire camp, arriving there at about 8:30 p. m.

3. *Attack Plan and Man-Power Estimates*—Before seeing the fire Fifield had ordered all the men (20) he knew were in camp at Wapiti CCC camp. Sizing up the smoke from Blackwater Lodge, and knowing that more men were returning from work to the CCC camp, he phoned again and requested 50 additional men or all that were available. Upon his arrival at the fire and before the arrival of the men, he made what appears

to be a comprehensive reconnaissance. The first 7 men under Foreman Bryan Sullivan had come voluntarily, having seen the smoke from their work, and gone to work on the control line from the point later used as First-Aid Station, before finding Fifield.

When the first crew direct from Wapiti CCC camp arrived, Fifield put them on the control line around the bottom of the fire and up the east and west sides. He then sent a messenger back to Blackwater Lodge to phone for 50 more CCC enrollees.

Sieker, en route to the fire, being apprised of the situation and Fifield's orders for men, stopped at Blackwater Lodge at 8 p. m. and phoned the Park Service CCC Lake camp asking for 50 men (this is the exchange number of men previously agreed upon in cooperative arrangement between the Shoshone National Forest and Yellowstone National Park) to arrive at the fire at 3:30 a. m. Saturday, August 21. (They actually arrived at 2:15 a. m.) Sieker also ordered a pump outfit and an extra supply of beds from Denver (these arrived at the fire at 12:45 p. m. Saturday, August 21).

At 9 p. m. Friday night Sieker met Fifield on the fire line, and after conference and reconnaissance the two officers estimated that the fire, which was then fairly quiet, had covered an area of about 200 acres, and that by the end of the first work period they would have a perimeter of 450 chains. Eighty chains of control line had been constructed at the time of the estimate, and Sieker thought 370 chains could be constructed during the first work period by the 110 men on hand and on the way.

It was Sieker's and Fifield's judgment at that time (9 p. m.) that the fire would not spread appreciably during the night. Events proved they were in error in this calculation of probabilities. Neither Sieker nor Fifield made a written record of this judgment determination.

The area, though quiet, was smoky and difficult to scout. After midnight the wind sprang up, crowning appeared in several places, and the fire began to move out rapidly up the basin of the fork of the Blackwater Creek in a southeasterly direction. Sieker realized the situation had changed sharply, and promptly put in an order through Assistant Supervisor Krueger at Cody (1:30 a. m.) for 50 men from Deaver CCC camp and 50 local men from the town and vicinity of Cody. (The 50 men from Deaver and about 15 men from Cody arrived at the fire at noon Saturday.)

District Ranger Fifield was in charge of the fire. In accordance with the Region 2 fire plan the District Ranger automatically takes charge. Supervisor Sieker rightly respected that arrangement of authority, but because

of his greater experience and familiarity with local conditions worked with Fifield in an advisory capacity. Such practice as a general policy should result in the best development of ability and leadership in fire control. Sieker, of course, stood ready to relieve Fifield at any time he thought his management inadequate.

They had scouted the fire properly, had assembled all facts, had appraised the behavior of the fire, and had placed orders for the number of men they thought necessary to corral the fire in the first work period. It was their joint conclusion. It turned out to be wrong, because, in the experience of these men, a strong night wind under these given circumstances was not to be expected or to be included in probabilities.

After consideration of all circumstances, I conclude that Sieker and Fifield, from the factors available to them, took action properly and in sufficient time to insure corralling the fire in the first work period.

A second factor contributing to the subsequent disaster appears in a review of the events of Friday night. At 10:50 p. m., while the fire was still quiet, Sieker was able to get through a call to the Cody office (where the dispatching function was working smoothly) to have a crew of 50 men from Tensleep CCC camp (F-35 on the Bighorn National Forest) report in the morning. He estimated they could arrive at the fire (a distance of 180 miles) at 8 a. m. Saturday. (Because of delay in transmission of the phone call through the towns of Worland and Tensleep and to road stops the men did not reach the fire until about noon Saturday.) Sieker's estimate of travel time for this crew proved to be short by four hours, but he could not have anticipated that his order would be delayed two hours in transmission, and such a truck trip had never been made. It seems reasonable that the crew could have been expected to arrive at the fire by at least 10 a. m. This two hours' lost work had vital effects.

On Saturday morning, because of lack of strength (non-arrival of the Tensleep crew) new line construction on the forward end of the line (eastward from a point near what is now termed Clayton Gulch) had to be abandoned and all men deployed along the constructed control line from that point back to the crest of Trail Ridge and down Trail Ridge, in order to hold what they had and suppress small spot fires.

The plan was to have the Tensleep crew, with Ranger Post, leapfrog the Park crew, under Foreman Wolcott, and the BPR crew, under Foreman Bert Sullivan, and complete construction of the control line from near Clayton Gulch up to the rim rock under Double Mountain at the head of the ridge above Posts Point. If Post's crew had arrived at 10 a. m. they

would have had sufficient time to complete the line job well ahead of the 3:30 p. m. gale, which caused the blow-up.

It is purely hypothetical, but a logical speculation, that had this line been completed Post and Clayton and their overhead, freed from the drive of line building, would have had time to consolidate their position; burning out unburned spots southeast and above the line, improving the line itself, mopping up and watching for and treating spot fires far down to the northwest in the location which later developed the spot fire which did the great damage. In spite of such work that might have been done in that lost two hours, it is likely that the 3:30 p. m. wind would have crowned out some of the surface-burnt area above the line and caused abandonment, but routes of egress would have been simpler and well known, and the fatal spot fire below the line, having been discovered and treated, might never have blown up.

4. *Control Line Placement and Construction*—The first crew to arrive (detached crew of 7 men under Foreman Bryan Sullivan) started to work where they hit the fire, a point close to the later established First Aid Station (see map). With good judgment, Sullivan, who had not yet contacted Fifield, commenced line construction up the north flank of the fire, which was then the lee side. The 22-man Wapiti crew, which next arrived, was met by Fifield and put to work along the right flank (southwesterly side of fire). The three Wapiti crews next arriving (15, 7, and 7-man strength, respectively) were well distributed to both flanks, and by 8 p. m. 58 men and 7 overhead were building line in an orderly manner and with good speed.

The first pump arrived and was set up in Blackwater Creek and was operating by midnight. Hose lines from this and the pump received later from Denver were run about 2,000 feet up the north line and about 5,000 feet up the west line. This was most effective in controlling fire spread within the pump's reach.

The 54-man crew from NP-3 of Yellowstone Park arrived at the fire at 2:30 a. m. Saturday after the wind had whipped up the fire. Fifield, realizing that the north side was then the most dangerous, sent the Park crew through Foreman Hill's Wapiti crew, working on the north side, and on up the south slope of Trail Ridge. By daylight this crew had built and was holding line up to the open point on Trail Ridge above where the line later was cut down through the timber on the left of the ridge.

The long west side of the fire had been controlled by the line which had been built to timber line under the cliffs of Coxcomb Mountain. The hold-

ing of this control line saved the great body of dense timber covering the main upper basin of Blackwater Creek, which was threatened several times by shifts of wind.

Early Saturday morning the man-power was about evenly distributed to the two main flanks of the fire. Control line construction was good; well trenched to mineral soil and litter, logs and brush removed. In most instances the work was right along the fire. At the top of the line on Trail Ridge, however, where the fire was surface burning down over the ridge to the north, there were some islands unburned.

This control line under the north side of Trail Ridge and along the edge of the surface-burning fire was the tough position of the north sector and was being started Saturday morning by the Park crew when they were pulled off new construction to hold built line down along Trail Ridge. The first reinforcement in the morning was the BPR crew, with Foreman Bert Sullivan in charge, which arrived at the top of the line at about 11 a. m. They were placed ahead of the Park crew, and started in on this control line construction under the ridge. In character and in speed it appears to have been the best line built, yet it was the line which was lost.

Up until the time of the arrival of Ranger Post with his 50-man Tensleep crew, District Ranger Fifield had had charge of the whole fire. At 1:30 p. m., Supervisor Sieker, at Upper Camp, gave instructions to Ranger Clayton, who had just arrived, to take charge of the advanced sector extending east and north from Trail Ridge, leaving Fifield in charge of the rest of the line from there down to the bottom and all around the west and south sides. Ranger Post, who was to take the forward end of Clayton's sector, was sent up Trail Ridge with Foremen Saban and Tyrrell and the Tensleep crew, with instructions to relieve and send into camp the men of the Wapiti crew, under Foreman Hill, and to leave the Park crew of 25 men, under Foreman Wolcott, in place to hold their line. Post was to pass on beyond the BPR crew, who were then building line at the head, and carry forward the line north and east.

Sieker and Fifield had been on the job for almost 24 hours, so at 3:30 p. m., as previously planned, Sieker instructed Assistant Supervisor Krueger (who had just arrived) to take charge of all line from the west end of Clayton's sector, down Trail Ridge and all around the bottom and up the west and south sides, thus relieving Fifield. However, the blow-up came at this time, and Fifield and Sieker remained in charge of the whole fire. Before these two men eventually left the job they had been up about 64 hours.

Ranger Post had arrived at the Lower Camp at 9 a. m. Saturday, it being understood that he would take charge of the Tensleep crew, which at that time was on the road and expected to arrive about noon. In his talk with Krueger in Cody early in the morning it had been agreed between them that it would be better for him to await the crew at Lower Camp rather than go ahead alone up to the head of the line.

The control lines, on the whole, were located to the best advantage and were well cleared and trenched. Viewed in aftermath, it might be considered that the one exception to uniformly wise line placement was the fatal subsector extending east and north from the high point on Trail Ridge.

During Friday night and early Saturday morning the main fire slopped over through the saddle in the ridge above the highest point on the ridge line. The fire slowly surface-burned down the north slope of the ridge in dense timber. This situation prompted the decision to put through a control line under the fire and along the burning edge. The first work on this line was done by the Park crew.

About 11 a. m. the BPR crew, Foreman Bert Sullivan in charge, passed through the Park crew and proceeded to continue this line, building to the east. The fire made a short run down a side ridge, but the BPR crew swung the line down under it and had it extended about to the sharp ravine in which Clayton and 6 men were later trapped, when Post's crew came through them. In view of the possibility of spots developing below (which they did), and the approach of mid-afternoon, with its to-be-expected winds, the pushing through of a line on this slope by the Tensleep and BPR crews appeared in first judgment to have been a dangerous undertaking. It was, however, the obvious tactics to be pursued by men directing fire fighting to hold the area and save timber. These officers and foremen are trained in the principle of "the fire must be corralled." They did not consider the situation dangerous, and certainly did not consider the move rash. It was the logical way to stop the fire and save the whole basin to the north of Trail Ridge. They did not know there was a sleeping spot "down in the hole," nor did they know the relative humidity registered the extreme low of 6 per cent at the Wapiti Camp at 1 p. m.

Had they known these things, and anticipated an afternoon wind, their action probably would have been different. But, weighing the known factors, Post and Clayton thought the job a normal undertaking and one not involving more than ordinary risk to men. An alternate to this would have meant abandonment of this sector, pulling all men out to Trail Ridge. If they had done this, the only logical next step would have been to

move the crews, with a loss of several hours, up Trail Ridge, around the base of the cliffs of Double Mountain and down Posts Ridge (later named) or the ridge southwest of Logging Gulch and establish new lines. With the later crowning and running of the fire, these positions may have proved just as hazardous as the position they did occupy. With the knowledge they had, and in view of their fire-fighting experience, I feel that their judgment and decision were right.

5. *Circumstances of the Blow-Up and the Tragedy*—The statement of A. A. Brown, presenting an analysis and reconstructed picture of the behavior of the blow-up fire of Saturday afternoon and the tragedy in its path, follows this article. The subject, during the review, was presented by Brown and came under full discussion of the investigating group. The Forest and Regional officers and I agree with the analysis and concur in the conclusion set forth in this written statement.

A point not mentioned by Brown is that Assistant Supervisor Krueger, who was directly over the fire area at approximately 12:40 p. m. Saturday, saw two stringers of smoke from spot fires below the newly constructed line (running east and north from Trail Ridge). These, however Krueger reports, were close to the line, and have since been identified as spot fires being worked on and not the spot fire down "in the hole," which at about 3:30 p. m. blew up and became the greatest factor contributing to the disaster. That critical spot fire was evidently not throwing smoke at 12:40, for it was not observed by Krueger.

6. *Summary*—After careful review of all the circumstances and acts I find no reason for criticism or organizational change. In reaching this conclusion, full weight and consideration were given to certain things which might have been done differently and better: the communication system was not of the best; the local cooperators failed to turn out as per fire plan; the probability of a night wind Friday night was not a part of the calculation; failure of the Tensleep crew to arrive earlier on Saturday probably contributed to the disaster; there was a lack of written messages and time notations; some unburned fuel was left above the line.

On the other hand, it is clearly evident that this fire was handled in a manner reflecting sound experience and knowledge. The placement and construction of control lines was well done, in spite of rough terrain and bad fuel. The large body of timber on the main basin of Blackwater Creek was saved by the handling of the west line. The camp management and feeding was efficient. Tools and equipment were sufficient and in proper condition. The enrollees were at all times under capable and watchful supervision

(overhead was in proportion of 1 to 10). The dispatching job and the assembly of suppression forces were adequate and well handled. The supervising personnel worked smoothly and without misunderstanding. They followed the approved Forest Service practices of fire control. Continuous hard work and intelligent action and courage show up through the entire four-day period.

Nothing can compensate for the distressing loss of human life, although there is some comfort in the knowledge that the leadership was intelligent and protective of the men.

Regrettable as it is, it must be recognized that in man's control of forest fires some accidents will occur—just as in city fire protection—without fault or failure on the part of anyone. Here was brought about a peculiar combination of circumstances rare in forest-fire history. It is reassuring to know that such occurrences are infrequent. Not since 1910 have so many lives been lost on a single national forest fire, and fatalities from burning are very uncommon, although probably more than 100,000 men fight fires in the average year.

