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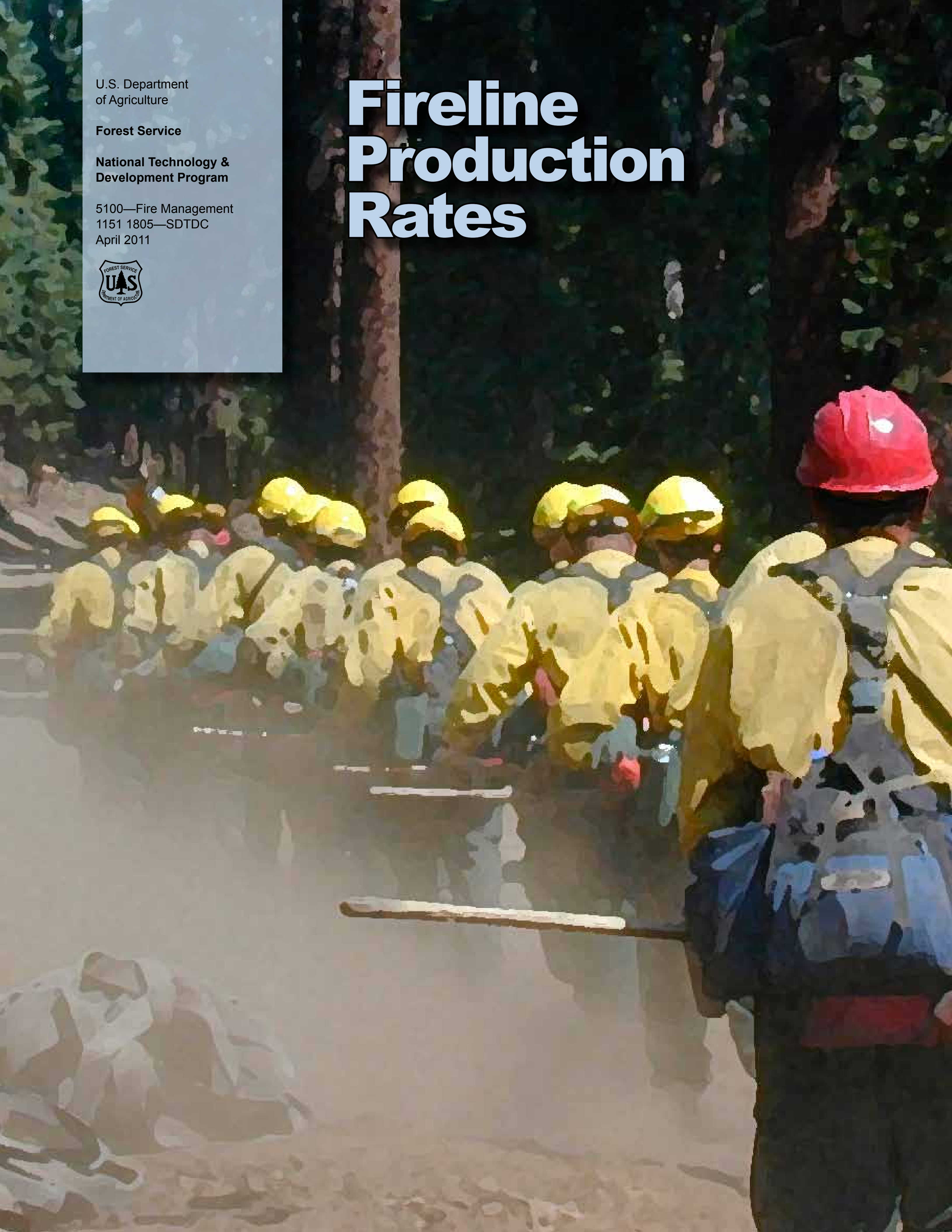
Fireline Production Rates



FIRELINE PRODUCTION RATES

by
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Fireline production rates are used for strategic fire management purposes to ensure that the appropriate number and type of crews are assigned to meet management objectives. These production rates also are used for planning purposes and in fire growth estimation models. Existing rates were outdated and often overestimated actual crew capability, which hinders accurate resource assignments and adversely affects model outputs. Through direct observation of crews on active fires throughout the United States, new production rates have been established, which reflect a 95-percent confidence limit. An upper and lower range of fireline production capability is also presented in this report.

KEY POINTS

- Current published fireline production rates do not reflect actual production rates.
- Accurate fireline production rates were needed.
- Multiple variables in the fire environment need to be evaluated and measured.
- New rates with a 95-percent confidence limit were developed for all crew types.
- New values include an upper and lower range for line construction rates.
- Hand crews spend less than 5 percent of a daily shift in rest breaks.
- Hand crews spend about 34 percent of a daily shift constructing fireline.
- Hand crews spend about 18 percent of a daily shift driving and/or hiking.
- Hand crews spend the majority of their time engaged in other mission-related activities, such as briefings, travel, and safety-related operations.
- Methods used in this project can be replicated to determine production rates for all other firefighting resources.

Over the years there have been many changes in fire management and in the fire environment. Increased fire behavior and larger fires are now more common. Although new technology and tools are available to firefighters and fire managers, one thing has remained constant: the single most common resource used to control wildland fire is still hand crews. Hand crews remain the most effective tool fire managers have to contain and control wildland fire. Hand crews perform this function by digging a handline directly along a fire's edge or indirectly at some distance from the fire.

Fireline production rates are defined as the expected length of fireline that can be constructed by a crew (or other resource type) in a given time. These rates are used continually for strategic fire management planning purposes and to determine yearly fire management programs. To more effectively utilize hand crews and develop tactics with a high probability for success, fire managers must know how far any given hand crew can construct a fireline in a given period of time under various conditions. Lack of accurate fireline production rates may cause fire managers to send too few crews to a division, which may result in a situation where the control objectives are not met and the fire eventually spreads beyond the projected control line. This not only increases the time and cost for containment, but also needlessly expends the resources of the hand crews, increases their exposure to hazards, and requires them to reengage in another location to start over.

Production rates also are used in decisionmaking, specifically the Wildland Fire Decision Support System (WFDSS) and planning for resource ordering. Correct assignment of resources for development of the WFDSS and evaluation of alternative depends on the resources' fireline production rates. Firefighting resource outputs (fireline production rates) will aid staff in determining the estimated costs versus the values protected associated with each alternative. Also, production rates are used in new large-fire growth estimation models and for effective preplanning and prepositioning of resources during times of high fire danger. Lack of accurate production measures may cause units to be understaffed, in which case effective initial attack would be compromised; or the unit could be overstaffed, creating a shortage in other areas of need. In these scenarios, the allocation of financial resources is not optimized. Outputs from models used for preplanning or decision support will show significant bias when inaccurate production rates are used. Because fire size estimation is based in part on production capability, basing dispatch or assignment decisions on these outputs could cause errors in fire size estimation, suppression expenditures, and probability of success. Fireline production rates are used in several fire size estimation models, as well as models designed to determine resource effectiveness and large-fire management efficiency. More accurate rates are important, particularly when these values are used for modeling purposes. Haven et al. (1982) state, “Errors in production models values have the potential for radically biasing the simulated results. Significant planning errors can be made by blind reliance on published rates.” Additionally, these rates are a critical input for the Fire Program Analysis (FPA); because the preparedness module (PM) of the FPA system relies on models, the accuracy of inputs, such as fireline production rates, must be quantified if the results are to be presented with specified confidence. The fireline production rate information is one of the most sensitive values in relation to the system outputs, and these standards are needed to operationalize the system.

The fireline production rates are published in the Fireline Handbook (PMS 410-1, NFES 0065). Although the Fireline Handbook is updated on a periodic basis, the production rates in use today were developed over 40 years ago (Hornby 1936; Lindquist 1970). Many fire managers and fire operations personnel recognized that the published rates were no longer valid, and a study by Haven et al. (1982) confirms that earlier published rates “vary by as much as 500% [sic].” There are several reasons why the old rates are no longer representative of the actual rates. Perhaps most importantly, the published rates were gathered many years ago and very few of the rates were measured while hand crews were actively engaged in fire suppression (Barney et al. 1992). This fact alone has a strong influence on the accuracy of the old rates. Although there has been previous research done to establish fireline production rates, this research was often limited in geographic scope, in the quantity of observations of active fire suppression activities, and in crew type observations. In some cases, the research relied on expert opinion rather than field observations (Fried et al. 1989). Barney et al. (1992) state that the limited data in their production rate study had precluded them from developing a detailed production rate model. Haven et al. (1982) point out that fireline production rates need to be determined under actual fire conditions. They also state that production rates determined under simulated conditions tend to overestimate actual production rate values.

These factors—combined with increased fire behavior, new crew types, new crew performance standards and training, and, most especially, with recent changes in safety and risk management guidelines—made it clear that new production rates were needed. It was evident that in order to establish rates with a high degree of confidence, actual field observations by trained observers were necessary. The San Dimas Technology and Development Center (SDTDC) of the U.S. Department of Agriculture, Forest Service, National Technology and Development Program, developed a set of protocols to meet these objectives. The first step in this process was to identify key individuals and groups who could provide technical assistance and those who needed production rates for strategic, tactical, and modeling purposes. It also was necessary to identify the resources required to support the field data acquisition portion of the project.

SUPPORT AND COOPERATION

Haiganoush Preisler of the Forest Service Pacific Southwest Research Station, Albany, CA, and Armando González-Cabán of the Forest Fire Laboratory in Riverside, CA, offered essential support in statistical analysis and development of data collection requirements to assure the accuracy and validity of the new rates. The National Interagency Hotshot Crew Steering Committee, the National Wildfire Coordination Group (NWCG) Incident Operations Standards Working Team (currently the Occupational Workforce Development Committee), Incident Management Teams (IMTs), and representatives from the Area Commanders/Incident Commanders Council all provided essential information and review of the field data collection matrix. The National Interagency Coordination Center (NICC) and the regional Geographic Area Coordination Centers (GACCs) provided support in the timely initiation of resource orders for the rapid response needed for field observers to gain access to ongoing incidents. IMTs provided access and support to SDTDC personnel during incidents throughout the country. This support and guidance proved to be invaluable to the success of this project and ensured that the results were meaningful.

FIELD DATA ACQUISITION

A data collection matrix (see appendix A) was developed that would provide a rich data set for analysis. Today, crews are tasked with many different missions. Changing fire behavior, larger fires, and new safety measures instituted as the result of tragic events have all combined to alter the daily routine of fire crews. With this in mind, a data collection matrix was designed to measure a variety of variables to account for the various crew activities that occur during a daily shift as well as environmental variables. Because the fire environment is dynamic, it was essential that field observers follow the crew throughout the entire shift.

In order for the observers to gain access to ongoing or emerging incidents, SDTDC staff contacted Incident Commanders or Operation Section Chiefs to ask if there were crews constructing handline and whether the IMT would provide access and support to the SDTDC crews. Once the IMT granted approval, SDTDC staff worked with NICC, the regional GACCs, or the local dispatch center to initiate a resource order. Upon arrival, SDTDC personnel explained the project goals and procedures to the IMT. Working with operations personnel, candidate crews were identified and SDTDC personnel discussed the project with the crew supervisor to get his/her approval to shadow that crew. Crew observations began at the morning operational briefing. No observations were done during night shift operations. The time was recorded for each activity the crew engaged in from the operational briefing until the end of their shift. (See the activity codes in appendix B.) SDTDC personnel shadowed the crew their entire shift to ensure that all measurements and time recordings were accurate. This constant observation allowed the SDTDC personnel to record any changes in the recorded variables, such as weather, topography, fuel model, fire behavior, number of personnel on the line, etc.

Distance measurements were taken with a logger's tape, firelines were tracked with global positioning system units (figure 1), weather readings were taken with a Kestrel 4000 Weather Meter (digital weather meter), and digital photos were taken every hour to record fire behavior, fuel model, and the overall fire environment.

Figure 1—Firelines tracked with GPS.

Figure 2—Fire crew at work.

Every effort was made to minimize the impact of the observers on the crews. Special attention was given at the crew briefing to assure crew members that this was not an evaluation or test and they were expected to work as they normally would. This was done so that the crew would work safely and also to minimize any "observer effect," which might otherwise distort the data. Researchers have found that when workers are being observed they tend to work harder, a concept known as the Hawthorne effect. During the course of this project, many different crews were observed to account for intercrew variability and the possibility of the Hawthorne effect. Every SDTDC observer was a fireline-qualified firefighter with many years of experience working on wildland fires (figure 2).

Fires and crews were chosen at random to eliminate sampling bias and whenever possible, a different crew was observed each day. Observations included Interagency Hotshot Crews (IHC) and Type II and Type II Initial Attack agency and contract crews. A fuel model field guide was developed for the SDTDC observers to ensure accuracy in fuel model identification. Fire behavior analysts on the fires were consulted whenever there were questions regarding the correct classification of the fuel model.

During the summer of 2005, SDTDC staff field tested the project equipment, protocols, and data collection matrix on several wildland fires. Dispatch protocols and communication protocols with IMTs and crews were established. Field data was collected from 2006 to 2009 with the assistance of several detailers and individuals who accepted resource assignments to support the lead data collectors.

Data collection observation summary:

- 1,547 shift hours.
- 50 fires.
- 125 days.
- 11 States.

Field data collection on active wildland fires presents many challenges. There were numerous days that crews were given assignments to construct handlines but, due to fire behavior and/or weather conditions, the crews were unable to engage the fire. Due to extreme fire behavior, crews being observed by SDTDC observers had to disengage from fire suppression tasks and retreat to established safety zones on several occasions. In other cases, changes in strategy meant the crews would be positioned on roads or natural fuel breaks and engage the fire when it reached that area. These changes resulted in less line construction than might otherwise have occurred. As IMTs implemented different variations of appropriate management response, crew assignments reflected these changes. *Point protection, management action points,* and *confine and contain* "strategies" possibly resulted in less line construction than in previous years. As a consequence of these factors and the challenges associated with rapid response data collection, there are certain gaps in the data. No data was collected in the slash fuel models, 11 through 13. Less data was collected in the grass fuel models, 1 through 3, than in timber fuel models. It was often the case with fires burning in grass fuel models, and a grass/sage component, that the chosen suppression strategy was burn-out operations conducted along a road, dozer line, or a suitable natural fuel break. In other cases, dozers were the preferred method of constructing fireline in grass/sage fuel models. Table 1 shows the data collection times for each fuel model per fiscal year for fireline construction.

Table 1. Data collection times for each fuel model

Fuel Model	FY05	FY06	FY07	FY08	FY09	FY05-09 Total
	Data Collection Times (hh:mm)					*hh:mm*
1	5:55	6:50	0:00	1:45	0:00	14:30
2	8:20	17:42	5:02	10:29	30:05	71:38
3	0:00	0:00	0:00	0:38	0:00	0:38
4	0:00	3:00	7:15	13:25	79:43	103:28
5	6:05	3:45	17:45	4:41	6:05	38:21
6	0:00	33:25	11:50	4:29	5:30	55:14
7	0:00	0:00	0:00	0:00	0:00	0:00
8	0:00	30:33	15:43	1:30	2:00	49:46
9	0:00	3:15	5:08	1:00	15:12	24:35
10	7:50	43:22	71:44	21:19	28:35	172:50
Grand Total	28:10	141:52	148:45	59:16	167:10	545:13

ANALYSIS

Based on our observations and analysis, fireline production rate values can be grouped into four classes: grass (fuel models 1 and 2), chaparral (fuel model 4), brush (fuel models 5 and 6), and timber (fuel models 8 through 10). These values shown in table 2 represent—with a 95-percent confidence—the sustained rate at which 20-person crews can construct fireline throughout a shift. An upper and lower range (confidence limits) of line-construction capability also is provided (table 2). The values in parentheses are the expected range. Since there was no statistical difference between Type II and Type II IA crews they are not shown separately.

Table 2. Sustained line production rates of 20-person crew in chains/hour (range shown in parentheses)

Fire Behavior Fuel Model	Current Rates Type I	New Rates Crew Type I Direct	New Rates Crew Type I Indirect*	Current Rates Type II	New Rates Crew Type II Direct	New Rates Crew Type II Indirect*
1 Short Grass	**30**	**17** (12–21)	**9.5** (7.7–11.3)	**18**	**9.5** (6–13)	**4.3** (3–6)
2 Open Timber Grass	**24**	**17** (12–21)	**9.5** (7.7–11.3)	**16**	**9.5** (6–13)	**4.3** (3–6)
3 Tall Grass	**5**			**3**		
4 Chaparral	**5**	**6.6** (5–8)	**5** (2.7–7.3)	**3**	**6.8** (3–11)	**4** (3–5)
5 Brush	**6**	**16.5** (14–19)	**4.9** (3.7–6.1)	**4**	**7** (4–10)	**4.2** (2–6)
6 Dormant Brush Hardwood Slash	Black Spruce **7** Others **6**	**16.5** (14–19)	**4.9** (3.7–6.1)	Black Spruce **5** Others **4**	**7** (4–10)	**4.2** (2–6)
7 Southern Rough	**4**			**2**		
8 Closed Timber Litter	**7** (conifer)	**10.5** (9–12)	**6.9** (6.0–7.8)	**5**	**6.8** (6–7)	**5.7** (4–7)
9 Hardwood Litter	Conifers **28** Hardwoods **40**	**10.5** (9–12)	**6.9** (6.0–7.8)	Conifers **16** Hardwoods **24**	**6.8** (6–7)	**5.7** (4–7)
10 Timber Litter and Understory	**6**	**10.5** (9–12)	**6.9** (6.0–7.8)	**4**	**6.8** (6–7)	**5.7** (4–7)

**The current production rate table does not provide values for indirect fireline construction.*

Table 3 provides the new values as feet/hour/crew.

Table 3. New values as feet/hour/crew

Fire Behavior Fuel Model	New Rates Crew Type I Direct	New Rates Crew Type I Indirect	New Rates Crew Type II Direct	New Rates Crew Type II Indirect
1 Short Grass **2** Open Timber Grass	**1,122** (792–1,386)	**627** (508–746)	**628** (396–858)	**285** (198–396)
4 Chaparral	**436** (330–528)	**330** (178–482)	**449** (198–726)	**264** (198–330)
5 Brush	**1,089** (924–1,254)	**323** (244–403)	**462** (264–660)	**277** (132–396)
6 Dormant Brush Hardwood Slash	**1,089** (924–1,254)	**323** (244–403)	**462** (264–660)	**277** (132–396)
8 Closed Timber Litter **9** Hardwood Litter **10** Timber Litter and Understory	**693** (594–792)	**455** (396–515)	**462** (396–462)	**376** (264–462)

No data was collected in fuel models 3, 7, and 11 through 13.

Since the number of firefighters actively constructing line varied from shift to shift—and often times during the course of one shift—production rates were calculated initially as foot/person/hour and then calculated to represent a 20-person crew. During field observations, the number of firefighters actively constructing line was monitored constantly to support the data analysis. The statistical design assures that the final production rate values are accurate and realistically reflect the field data.

The data also were analyzed to see if other factors in the fire environment affected production rates. Regression analysis was done to determine the effect of each variable on production rates. The analysis compared rates against variables, such as temperature, slope, and relative humidity. The fuel model was the most significant variable affecting production rates. Analysis for the new production rates was determined by controlling for crew type and fuel model. Differences in production rates associated with direct/indirect handline may be caused in part by the fact that indirect line construction often involves wider brush clearing and more effort is expended to create a larger fuelbreak (figure 3). Another factor contributing to this difference may be the urgency associated with constructing direct handline as opposed to an indirect line.

Figure 3—Fire crew creating a larger fuelbreak.

FINDINGS

New production rates were established for IHC and Type II and Type II IA crews, (agency and contract). No statistical difference was found in production capability between Type II and Type II IA crews so they are grouped together. Differences in production rates were found between direct and indirect handline for all crew types, so they are provided in the new tables. In order to present the rates with a 95-percent confidence level, the rates are grouped into four classes.

CREW SIZE AND EFFICIENCY

The data show an inverse relationship between crew size and productivity for IHCs. As the number of crewmembers constructing line increases, the production rate decreases. As the number of IHC firefighters working the line approaches 15, the production rate for IHCs levels off (figure 4). Type II and Type II IA crews show a linear relationship; the production rate continues to decrease as the number of firefighters working a section of line increases. Even though the standard crew size is 20, there are seldom 20 firefighters constructing fireline at any given time, especially with IHCs. IHCs are often deployed in modules of 10 or fewer; this allows these crews to work at optimal capacity and also provides more tactical flexibility for fire managers. Crew supervisors and foremen are not directly engaged in handline construction, there is often at least one lookout per crew, and crewmembers are sometimes engaged in other duties. The optimal number of firefighters constructing line on Type II and Type II IA crews appears to be 10 (figure 4).

In figure 4 (direct and indirect handline are controlled in this analysis), the solid line represents the expected departure from average, and the dashed lines represent the 95-percent confidence limit of the expected departure from average. The IHC expected departure drops below 0 due to the one outlier.

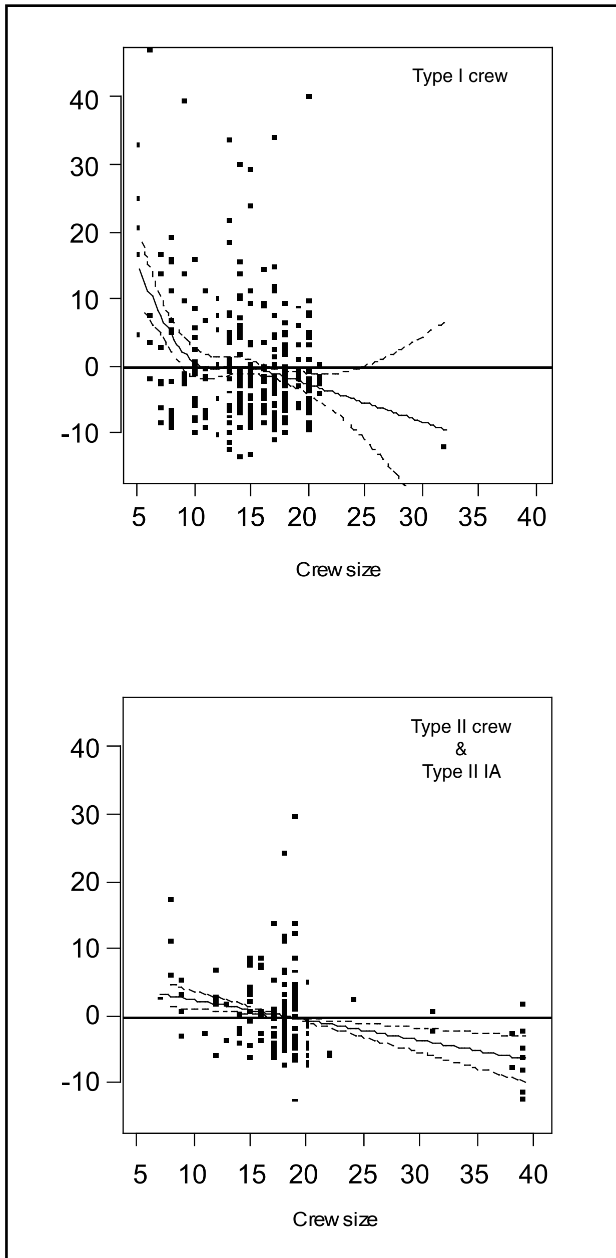

Figure 4. The optimal number of firefighters constructing line on Type II and Type II IA crews.

Crew supervisors and division supervisors can use the new values to evaluate crew performance and efficiency during suppression actions. At any given time during a shift, a crew should be constructing handline within the ranges provided in the new table. Although others have asserted that production rates vary over the course of the shift, we did not find this to be true (Lindquist 1968). If an otherwise highly trained and organized crew performs below these rates, it may be an indication that the crew is experiencing high levels of fatigue, smoke exposure, or other health issues that need to be addressed. Underperformance may be a health or safety issue that the crew supervisor, division supervisor, or safety officer should investigate and address. These new production rates can be used as a valid metric to measure the performance of all crews.

Data was analyzed to determine when crews were constructing fireline, activity 1 and 2 (figure 5). In most cases, fireline construction began after the third or fourth hour of the shift. There are some instances where line construction activity begins within the first and second hour of the shift (typically 0600 to 0700). These are most often cases where the crew was line-spiked out (camped along the fireline) or at a remote camp location on the fireline from the previous shift. When crews are line-spiked, travel is minimal and the morning operational briefing provided over the radio is shorter than the briefings at the Incident Command Post. This finding may show the benefit of line-spiking crews to increase the efficiency and effectiveness of crew utilization. Crews that are spiked out realize more opportunities for line construction and can engage the fire earlier in the day, thereby taking advantage of decreased fire behavior. When crews are able to begin line construction sooner, they can build more line in a shorter shift, thereby allowing more time for rest periods. Additionally, crew exposure to travel risks can be reduced by eliminating extended driving or hiking and/or crew shuttles in helicopters. Spike camps and line spikes often present other logistical and safety issues that must be considered and mitigated in determining the best approach to effective fire management.

Figure 5 depicts the amount of time and the time of day crews are engaged in each observed activity. The numbers on the left of this figure represent each hour of the shift and the corresponding color gives the time since the start of the shift. The numbers across the top represent each activity. For example, yellow refers to 7 hours from beginning of the shift in each column. The width of the box is proportional to the sample size; the length of the box represents the time spent in that category. Purple, for example, which is the first hour of the shift, shows that most of the time spent in briefings (activity 10) takes place at the start of the day. Briefing times include the operational briefing, division breakout, crew briefings before the crew engages the fire, briefings required if the crew assignment changes during the shift, or other briefings deemed necessary as fire and weather conditions warrant.

The data show that approximately 34 percent of a shift is dedicated to handline construction; the remainder of the work crews do throughout the day is in direct support of the strategy and tactics for that operational period. Reducing the time crews spend on other activities by 10 percent could increase the time available for line construction by 19 percent each shift. This could effectively provide an IMT with nearly 20 percent more capability at no additional cost by more effectively utilizing crew time. Crews rest for only 4 percent of their shift; this includes lunch breaks as well as shorter resting periods during the day. In figure 5, the width of the box is proportional to sample size. Length of the box is proportional to total time spent. Colors indicate the time since start. Numbers on the left are shift hours. Numbers on the top are activity codes.

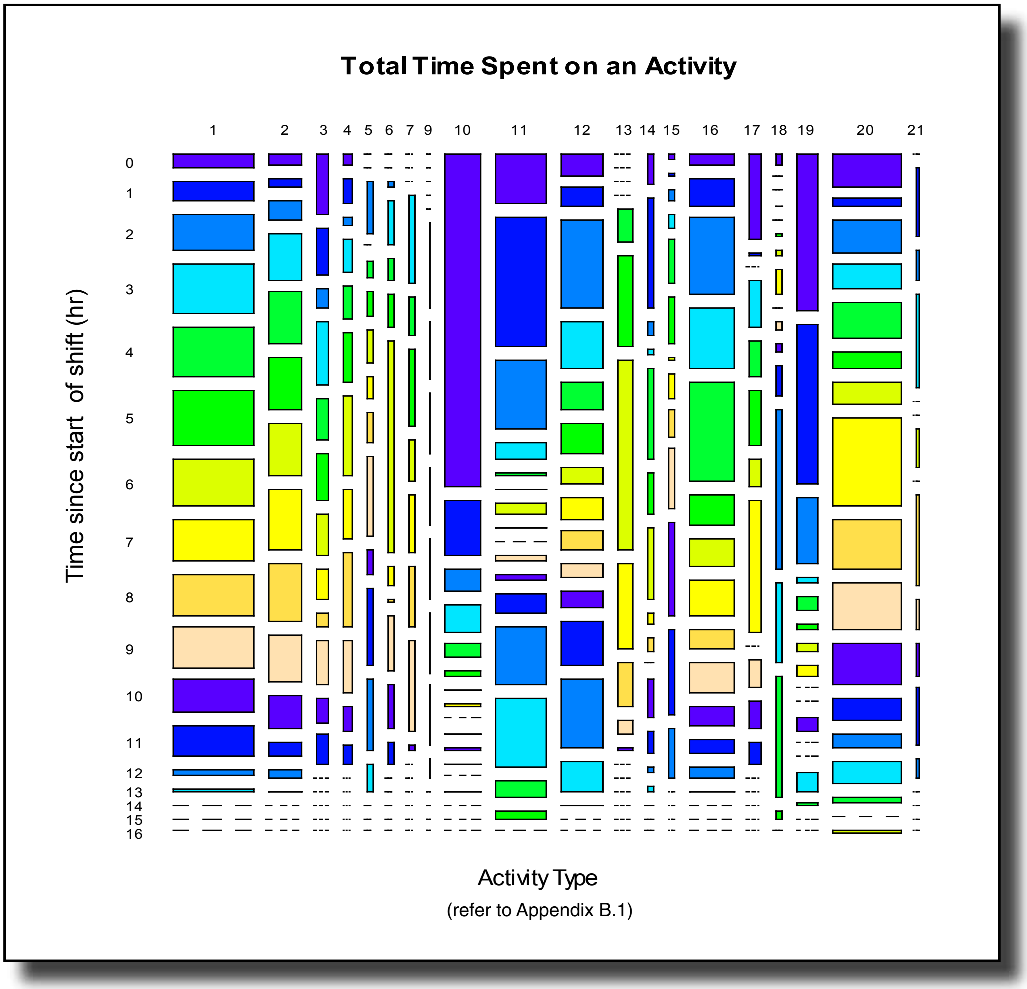

Figure 5. Total time spent on an activity.

These new production rate tables will be provided to the NWCG, Operations and Workforce Development Committee (formerly the IOSWT) for inclusion in the next edition of the Fireline Handbook. The new values also will be provided to the Fire Program Analysis (FPA) system for use in the preparedness module (PM). It is expected that these values also will improve the outputs from the WFDSS. These new fireline production rates will improve the estimated costs versus the values protected associated with each WFDSS alternative. These tables can be available in the planning section at ICPs for a quick reference when planning daily tactics. Incident Management Teams can use this methodology to monitor their resource utilization performance.

The methodology developed in this project can be replicated to determine production rate values for resources requested by FPA and other fire managers that are not currently available in the Fireline Handbook, such as timber harvesting equipment, and to update production rates for dozers and engine crews.

ADDITIONAL ANALYSIS

Individual production rates were calculated for each fuel model in which data are available. Statistical accuracy and appropriate use of this information is dependent on the sample size for each fuel model and crew type. Future analysis of the data will be done to elicit additional findings from this data collection effort. This analysis will be made available to those interested in utilizing this information for modeling or other purposes.

SUMMARY

This SDTDC project has been able to provide statistically sound fireline production rates due to the extent and accuracy of the field data and the supporting statistical analysis. In their study of fireline production rates: Barney et al. (1992) identify several factors that are necessary in order to accurately determine fireline production rates; additional data, more precise information, additional variables in the fire environment, trained observers, and precise definitions of variables. Haven et al. (1982) recommended that any future production rates be measured under actual fire conditions as rates determined “under simulated conditions tends to be higher than productivity measured under actual fire conditions.” Fried and Gilless (1989) also question the accuracy of production rate values that have been determined under simulated conditions or at any time other than actual fire suppression actions. The SDTDC study relied on data collected solely during actual fire operations by trained individuals whose only mission on the fire was to observe and collect production rate data. Through the combined effort and cooperation of many individuals, IMTs, and crews, and a comprehensive data collection protocol, the SDTDC study has met all the recommendations set by these researchers.

Accurate fireline production values will provide fire managers, dispatchers, planners, and decision-support personnel the ability to assign the right type and number of resources for the assignment.

Although fire crews may be engaged in line construction for 34 percent of their shift, the other work they are involved in supports the strategy and objectives of the incident. Fire crews spend on average 4 percent of their shift on rest breaks. Fire managers must make certain they provide adequate and appropriate rest opportunities for crews when they are off shift.

The procedures used in this project can be replicated to determine the production rates of other firefighting resources.

Further research into the most efficient crew size for IHC, Type II, and Type II IA crews could provide valuable information to increase the efficiency and utilization of hand crews.

Also, additional research should be done to determine production rates for slash fuel models and heavy equipment.

ACKNOWLEDGEMENTS

The support given to SDTDC from various individuals and groups is greatly appreciated. Their continued support during this project assured the success of this work. Among those responsible for this success are: NICC, NWCG IOSWT, AC/IC Council, regional GACCs, many local dispatch centers, and numerous Type I and Type II IMTs. We would like to especially thank all the crews who participated in this effort. These crews continually showed a high regard for safety, acted in a professional manner, and exemplified the high standards of the firefighting community.

Finally, several individuals were involved in the data collection portion of this project. These individuals worked diligently and professionally, traveling throughout the country for extended periods of time. Their attention to safety and in collecting accurate data under dynamic fire conditions has made it possible to develop these new production rate values. The individuals detailed to SDTDC for data collection purposes were Chris Bolz (2 seasons), Lauren Blake, Nick Mendoza, and Alberto Ortega. Haiganoush Preisler, from the Pacific Southwest Research Station, was instrumental in ensuring that the final statistical analysis accurately reflected the field data and provided support throughout the entire project. Armando González-Cabán, from the Riverside Fire Lab, provided essential support and guidance during the development of the field data collection protocols and worked closely with the project leader during data analysis phases of the project.

The National Technology and Development Center's national publications are available on the Internet at: <http://www.fs.fed.us/eng/pubs/>.

Forest Service and U.S. Department of the Interior, Bureau of Land Management employees also can view videos, CDs, and National Technology and Development Center's individual project pages on their internal computer network at: <http://fsweb.sdtdc.wo.fs.fed.us/>.

For additional information on fireline production rates, contact George Broyles at SDTDC. Phone: 909–599–1267 ext 277. Email gbroyles@fs.fed.us.

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Fireline Production Rate—Form One

Incident—IMT—Information Date ______________________

SDTDC Crew Leader ______________________

SDTDC Crew Members ______________________

Start of Shift ____________ End of Shift ____________

Equipment Kit Number ______________________

Incident Information

Fire Name ______________________

Fire Number ______________________

ICP Phone # ______________________

ICP Location ______________________

Complexity Level ______________________

Incident Management Team

Team Name ______________________

Incident Commander	Name	______________________
	Email	______________________
	Phone	______________________
Deputy IC	Name	______________________
	Email	______________________
	Phone	______________________
Safety Officer	Name	______________________
	Email	______________________
	Phone	______________________
Operations Section Chief	Name	______________________
	Email	______________________
	Phone	______________________
Operations Section Chief	Name	______________________
	Email	______________________
	Phone	______________________
Point of Contact	Name	______________________
	Email	______________________
	Phone	______________________

Fire Locations

State(s) ______________________

Ownership(s) ______________________

Fireline Production Rate Crew—Form Two

Fire Suppression Crew Information Date ____________________

Fire Name ____________________

Crew Name ____________________ # Crew Members ____________________

Crew Type ? I ? I (IHC) ? Agency ? Other
? II ?II (IA) ? Contact

Home Unit ____________________ **Year Established** ____________________

Crew Superintendent	Name	____________________
	Email	____________________
	Phone	____________________
Captain	Name	____________________
	Email	____________________
	Phone	____________________
Captain	Name	____________________
	Email	____________________
	Phone	____________________

Years' Experience*	**# of Crew**	**Qualifications****	**# Years**
1 year	______	Superintendent	______
2 years'	______	Asst. Sup/Captain	
3 years'	______	Asst. Sup/Captain	______
4 years'	______	Squad Boss	______
5 years'	______	Squad Boss	______
5-10 years'	______	Squad Boss	______
10-15 years'	______	Squad Boss	______
15+ years'	______	Other	______

** Years' experience: List number of crew members by years of experience on this type of crew.*

*** Qualifications: List number of years the individual has been qualified and actively engaged in this position. Include years with other crews, not just current crew.*

Number of days on current assignment ____________________

Number of assignments this season ____________________

Number of days on assignment this year ____________________

Fireline Production Rate Activity—Form Three

Daily Fire Suppression Crew Report Date ____________________

Fire Crew Name ____

Fire Name ____

Operational Period (Time on Shift)

Time on Shift __________________ End of Shift ________________________

Pre-Fireline Production			Activity Description	
Activity #	Start	End		
_______	_______	_______	10	Briefing
_______	_______	_______	11	Driving
_______	_______	_______	12	Hiking
_______	_______	_______	13	Lunch Break
_______	_______	_______	14	Transition Break
_______	_______	_______	15	Rest Break
_______	_______	_______	16	Operational Break
_______	_______	_______	17	Safety Break
_______	_______	_______	18	Retool
_______	_______	_______	19	Preparation
_______	_______	_______	20	Other
_______	_______	_______	21	Other—Travel

Tools

Tool Type	Amount	Tool Type	Amount
Pulaski	__________	Combi	__________
McLeod	__________	Specialty	__________
Rake	__________	Specialty	__________
Shovel	__________	Specialty	__________

Comments ____

____

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Fireline Production Hourly Observation—Form Seven

Fire Name ______________________________ **Record #** ______________ **of** __________

Crew Name ______________________________

# of Crew Online ______________________
Date ______________________
Start Time ______________________
Fuel Model (13) ______________________
Fuel Model (40) ______________________
Slope % (+/-) ______________________
# of Lookouts ______________________
Temperature ______________________
RH ______________________
Wind Speed ______________________
Wind Direction ______________________
Slope Aspect ______________________
Canopy % ______________________
Elevation ______________________
End Time ______________________
Distance ______________________

Fire Behavior	Slash
? Ground	? Heavy
? Surface	? Moderate
? Torching	? Light
? Crowning	
? Spotting	

Flame Height	Fire Activity
? 0-2 ft	? Backing
? 2-4 ft	? Head
? >4 ft	? Flank

Brush	Fuel
? 0-2 ft	?
? 2-4 ft	? Heavy
? 4-6 ft	? Moderate
? >6 ft	? Light

Imaging Reference #s ________________ **GPS Files** ____________________________

Direct	Indirect	Width	Felling
? Scratch	? Scratch	? 0-1 ft	# Sawyers
? Under Slung	? Under Slung	? 1-2 ft	
? Cup Trench	? Cup Trench	? 2-3 ft	# Swampers
? Over Slung	? Over Slung	? >3 ft	

Removal Width	Removal Height
? 1 Side ? 2 Sides	? 1 Side ? 2 Sides
? Brush	? Brush
? Ladder Fuel	? Ladder Fuel
? 1-2 ft	? 1-2 ft
? 2-3 ft	? 2-3 ft
? 3-5 ft	? 3-5 ft
? >5 ft	? >5 ft
?	?

Offline (Non-Production Time)

	Activity #	Start	End
	______	______	______
	______	______	______
	______	______	______
	______	______	______
	______	______	______
	______	______	______
	______	______	______
Dozer Improvement	______	______	______
Holding	______	______	______
Firing	______	______	______
Handline Improvement	______	______	______
Firing	______	______	______
Cold Trailing	______	______	______

Activity Type

Designation	Description
1.1	Handline Direct Scratch
1.2	Handline direct Under Slung
1.3	Handline Direct Cup Trench
1.4	Handline Direct Over Slung
2.1	Handline Indirect Scratch
2.2	Handline Indirect Under Slung
2.3	Handline Indirect Cup Trench
2.4	Handline Indirect Over Slung
3.1	Dozer Line Direct
3.2	Dozer LIne Indirect
4	Cold Trailing Direct
5.1	Improving Direct
5.2	Improving Indirect
6.1	Holding Direct
6.2	Holding Indiret
7	Line Preparation
10	Briefing
11	Driving
12	Hiking
13	Lunch Break
14	Transition Break
15	Rest Break
16	Operational Break
17	Safety Break
18	Retool
19	Preparation
20	Other
21	Other—Travel

Figure B.1—Activity codes.