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TECHNOLOGY TRANSFER NOTE

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IGNITION PATTERNS USED IN PRESCRIBED BURNING

A successful prescribed fire is one that is executed safely, burns under control, accomplishes the prescribed treatment and attains the land and resource management objectives for the area involved (Fischer 1978). The ablility to predict the type of fire behavior that can be expected from a prescribed burn should increase the probability of its success. This requires a sound knowledge not only of the effects of fuels, topography and weather on fire behavior but also an understanding of how various ignition patterns could influence a prescribed fire.

The purpose of this Note is to present some general characteristics associated with ignition patterns that could be used during prescribed burns. The ignition patterns are described below and illustrated in Figure 1. This information however, is only a summary compiled from publications by Brown and Davis (1964), Sando and Dobbs (1970), Wright and Bailey (1982), Chandler et al. (1983), Pyne (1984), and Merrill and Alexander (1987). The original publications should be consulted if more detailed explanations are required.

Backfire Ignition

Definition: The setting of a line of fire so that it will burn away from a control line against the wind or downhill.

General Fire Behavior: This is a slow-moving,low intensity fire, with low spotting potential.

Common Uses: It is used for underburning in exceptionally heavy surface fuels or when burning under hazardous conditions. Also, it is often used to widen wildfire control lines (commonly referred to as burning out).

Advantages: This fire produces the least smoke per unit time, and combustion is more complete with less damage to the overstory. There are also fewer safety problems and the lowest chance of escape.

Disadvantages: The fire spread is very slow (often less than 1 m/min) making large areas difficult to burn at one time.

Head Fire/ Strip Head Fire Ignition

Definition: The setting of a line of fire so that it will burn with the wind or upslope away from a control line. Note that a head fire is called a strip head fire if successive parallel strips of an area are ignited so that each one burns adjacent to the strip previously burned.

General Fire Behavior: Rate of spread can be rapid, but it is controllable by adjusting the distance between strips. Spotting can occur and there may be torching or crowning in some fuel types.

Common Uses: This type of fire appears to be effective in killing underbrush and certain tree species. It is also useful where surface fuels are light (e.g., aspen stands).

Advantages: The fire spread is relatively fast so large areas can be burned at one time. Rate of spread and intensity can be adjusted by changing strip width which reduces the chance of an escape fire. This type of fire is also useful when higher humidities and fuel moisture conditions exist.

Disadvantages: The fire is smoky and difficult to control at its head. There is a potential for high intensity fires and spotting.

Flank Fire Ignition

Definition: The setting of a line of fire along a line parallel to the wind with the fire spreading at right angles to the wind or across a slope.

General Fire Behavior: The flank fire is faster moving than a backfire, but it is slower and less intense than a head fire. There is a potential for isolated crowning where two flanks merge.

Common Uses: Seldom used over extensive areas, it is often employed as a modification of backburning to reduce the amount of time involved in the operation.

Advantages: It is useful when fire danger is low and if it is difficult to maintain a backing fire. It is less erratic than a head fire.

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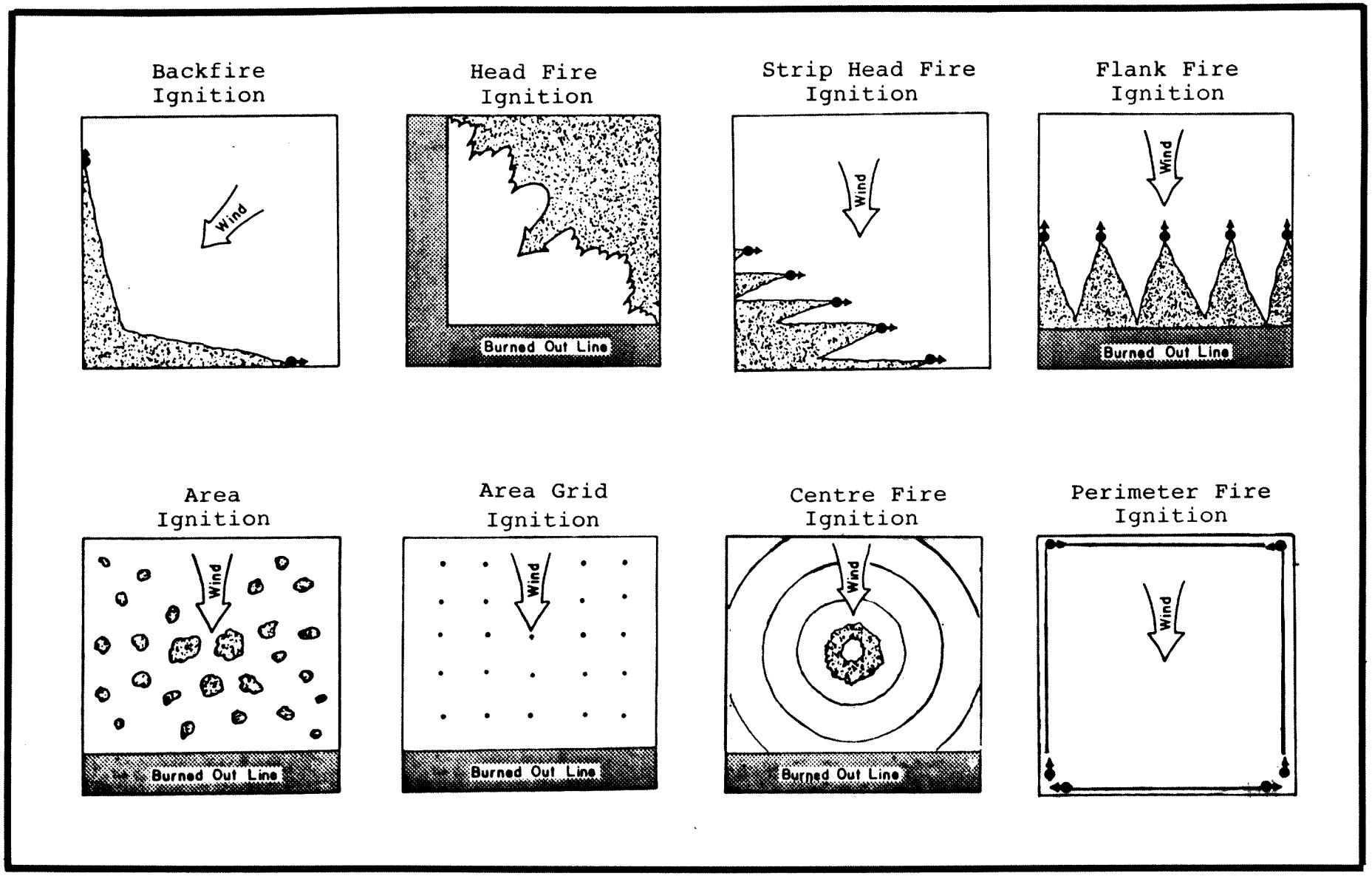

Figure 1. Examples of ignition patterns used for prescribed burning (adapted from Wright and Bailey 1982).

Disadvantages: Steady wind conditions are required. Exceptional firing-crew coordination is necessary.

Area Ignition

Definition: The setting of a number of individual fires throughout an area either simultaneously or in quick succession and so spaced that they soon coalesce, influence, and support each other to produce a hot, fast-spreading fire thoughout the area.

General Fire Behavior: Fires are set close enough together to allow them to interact soon after ignition. This results in a high intensity fire which, in the absence of a strong wind, produces a single convection column.

Common Uses: It is useful in areas with large amounts of fuel where slow moving fires are not desirable or feasible. It is conducted mostly when areas adjacent to the burn area will not support fire spread independently (e.g., after leaf flush).

Advantages: A high intensity fire is created. Because the fire is spreading towards the centre, narrower fire breaks can be used. Large amounts of fuel can be consumed.

Disadvantages: Near simultaneous ignitions are necessary. Strong convective development may produce fire whirls or extensive spotting.

Area Grid Ignition

Definition: The setting of a number of individual fires throughout an area so spaced that they will spread independently over most of the area before finally reinforcing one another.

General Fire Behavior: Fires will grow from their initial ignition points to be of moderate intensity, but strong convective development can be avoided.

Common Uses: Large areas can be effectively burned in a short period of time. It is useful when minimum damage to standing trees is desired (e.g., burning slash under partial clear-cuts).

Advantages: Carefully selected burning conditions that may seldomly occur can be utilized. Fire intensity can be controlled by adjusting the grid pattern for ignition.

Disadvantages: In some spots, changing weather conditions may result in a higher intensity fire than was desired. Considerable time must be spent on determining the optimum grid pattern for ignition. It usually works best with aerial ignition devices.

Centre Fire Ignition

Definition: The setting of fires in the centre of an area or concentrated to create a central convection column with additional fires set progressively and less concentrated near the outer control lines.

General Fire Behavior: The fire is drawn towards the centre of the area and a well developed convection column is formed. Intensity depends on the timing and location of the subsequent rings of fire.

Common Uses: It is used in areas of large heavy fuel concentrations such as land clearing burns, or clear-cuts.

Advantages: Because the fire is drawn towards the centre, it is easier for ground crews to work on the outer edges. Smoke dispersal is excellent and a very high intensity fire can be produced.

Disadvantages: This type of fire is best accomplished by aerial ignition. The timing of the subsequent ignitions outward from the centre of the area is crucial to convective development. It is not appropriate on areas with light fuel loadings, since the centre may burn out before convective activity begins. Long distance spotting may occur.

Perimeter Fire Ignition

Definition: The setting of a series of fires or a line of fire around the perimeter of an area and allowing the fire(s) to burn toward the centre of the area. This may or may not involve centre firing. Typically, fires are set on the downwind side to produce a backfire, then along the sides of the area to produce flank fires, and then on the upwind side to produce a head fire.

General Fire Behavior: Once fire exists on all sides of the area, the control over its behavior is lost. Intense convective activity can occur when the fires merge with the consequent danger of spotting.

Common Uses: This ignition pattern is recommended only for light fuels or in special situations such as clear-cut areas in the spring when the surrounding timber still contains snow cover.

Advantages: It is the least expensive technique, if the fire remains under control.

Disadvantages: Smoke and sparks have a tendency to blow outside the burn area. It is not suitable for large areas or areas with heavy fuel loadings.

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