

Brush Fire Operations

by Deputy Chief James E. Leonard and Battalion Chief John A. Calderone



Working from the already burnt-out area allows Firefighters to safely approach the fire.

The material contained in this article is taken from the subject matter taught at the Chief Officer Command Course at the Fire Academy. It covers all aspects of brush fire operations.

allow the fire to burn itself out.

Introduction

There are all kinds of specialists in FDNY--haz-mat, rope rescue, trench, collapse, high-rise fires, row frames, brownstones, etc.--but the one area with which most FDNY Firefighters have little or no experience is brush fire operations. Members tend to treat brush fires as a nuisance and downplay these operations.

However, a sobering statistic is that one of every eight Firefighters killed in the line of duty in the United States died at a brush/wildland fire. Most of these Firefighter deaths took place at the perimeter of a large fire, in and around light fuels, such as grass, brush or marsh weeds, typical of the vegetation found in New York City. Most of these deaths occurred when the wind changed in speed or direction, causing these light fuels to flare up, trapping the Firefighters. Few deaths actually occurred in forests. *FDNY has experienced three line-of-duty deaths at brush fires.*

The brush fire problem in New York City is nowhere near as widespread as it once was, but it is more severe. Many more structures have been built in recent years, eliminating many recurrent brush fire areas. However, many of these structures have been built right up to and even into wildland areas, creating more imminent exposure problems. Another recent problem is that much of the existing natural vegetation is protected by law and cannot be cut down around homes to create a firebreak.

Operational objectives

The operational objectives at brush fires differ from structural fires. The life safety of both civilians and Firefighters always is the primary goal. At brush fires, however, exposure protection comes next, followed by confinement of the fire and then extinguishment. Protection of exposures is given a higher priority than confinement. Sometimes, it is better to protect exposures and

Seasonal problem

Brush fires are seasonal problems; they are cyclical and totally weather-driven. Brush fire seasons generally occur in the spring and fall, but can happen at anytime, based on weather cycles. Brush fire "seasons" have occurred in every month of the year. Brush fires are part of nature's normal growth cycle rejuvenation process.

Certain weather conditions are favorable to brush fires. These conditions include low humidity, winds greater than 15 mph and no rainfall for the three preceding days. The longer the period without rain, the greater the hazard and the higher the probability of brush fires occurring.

Water supply

Fire hydrants are always the best positive source of water supply. However, at brush fire operations, sometimes it is necessary to employ other water sources. If access for apparatus is possible and water depth is sufficient, it is possible to draft from available streams and ponds. Portable pumps (dewatering pumps) can be used from streams, ponds and swimming pools to supply a hand-line with a positive water source. Indian pumps commonly are used when brush fires take place off-road and at a distance from hydrants. (See photo on page 15.)

Relaying water using multiple pumpers is a tactic to be considered, but it is time-consuming and will tie up multiple apparatus. Utilizing booster tanks from engine company apparatus and brush fire units (BFU) facilitate mobility while attacking remote fires. When operating with booster tanks or Indian pumps in areas without hydrants, ensure that lines are stretched close to the point of operation to refill the booster tanks and Indian pumps, reducing turnaround times. An engine company or BFU also can be designated to refill Indian pumps close to the point of operation, preventing members from walking long distances back and forth to the roadway.

Size-Up

Brush fires can be fast-moving and they expand rapidly. The first Officer to arrive should immediately call for sufficient units to overwhelm the fire. Don't wait to see what can be done first. Brush fire operations are extremely labor-intensive and require a large commitment of manpower early in the operation.

The first Officer should consider the following in his size-up:

- The life hazard in exposed buildings and possibly people in the wildland area involved.
- Exposures in danger.
- Wind velocity and direction.
- Size of the fire and direction in which it is moving.
- Combustibility of vegetation.
- Access to fire (roads, trails, footpaths).
- Water supply (hydrants, streams, creeks, ponds, etc.).
- Terrain (level, hills, marsh, swamp).
- Response time of units.
- Any other factors that may affect the operation.

Response time can be a critical consideration in this size-up.

Most large brush fires take place in areas of the City where companies are located far apart. Couple this factor with the possibility that the normally assigned units may be out at other simultaneous brush incidents and response times of additional units can greatly increase.

Extension

Wind is the primary factor for fire extension at brush fires. The fire travels with the wind. The stronger the wind, the more rapid the fire spreads. The wind also will carry and fan brands, resulting in additional spot fires downwind. With the correct wind conditions, brush fires can jump wide streets. Brush fires burn uphill rapidly, creating strong thermal updrafts ahead of the fire.

Tactics

Tactics at brush fires differ from FDNY's standard operating procedures (SOPs) at structural fires. On arrival, emphasis should be placed on protecting exposures. Initial attack operations should concentrate on mobility. Avoid hooking up to hydrants except to protect exposures. Once exposures are covered, fire attack can begin.

Mobility of apparatus must be maintained to cover situations that develop quickly due to shifting winds. Consider wetting down unburned areas ahead of the fire.

In general, avoid a frontal assault. Do not operate in front of the fire. In the rare instance that it becomes necessary to operate in front of the fire to protect life, sufficient charged lines and large-caliber streams--capable of protecting operating forces--must be in place. An onrushing wall of fire can overpower the Firefighters.

Stretching hand-lines is labor-intensive and often, by the time these lines are in position, the fire has burnt out that area and moved well beyond the stream's reach. Avoid chasing the fire, running out of hose or exhausting operating forces.

Attack the fire from the sides and attempt to narrow its spread, eventually heading it off. Extinguish the perimeter from the flanks first and then move to interior burning areas. Any lines operating on the perimeter should be mobile, moving quickly along the flanks to knock down extending fire. If using hand-lines, be prepared to extend them quickly before the fire moves out of reach.

Probably the most effective action at a large brush fire is proper application of the stream. The stream should be directed at the brush that is burning, not at the flames burning above the brush. There is a natural tendency to be drawn to the heavy volume of fire burning above the brush, but to

Types of Brush Fires

- **Surface fires** burn grass, weeds, small trees, leaves on the ground, etc., and are the most common type of brush fire. Surface fires are fast-moving.
- **BoG fires** start on the surface and burn down into soft, spongy ground. These are common in dried-out swamps or marshlands, burn slowly and can burn for days or weeks.
- **Crown fires** burn along the tops of trees, extending by direct flame contact or radiation. While rare in New York City, they have occurred here.

Terminology

- The **head** of the fire is the leading edge of a moving fire.
- The **rear** of the fire is the side opposite the head.
- **Flanks** are the sides of the fire--designated left or right--as you look at the blackened area from the rear.
- **Fingers** are strips of long, thin sections of fire extending outward from the main, blackened fire area.
- **Spot fires** are isolated small fires, downwind from the main fire, and are caused by brands carried by the wind.

be effective, the stream must be directed at the actual burning vegetation.

Use two-Firefighter teams working with Indian pumps and brooms along the flanks near the head of the fire. The majority of brush fires are controlled this way. Bypass stumps, trees and other smoldering items inside the burned-out area until the fire is controlled and sufficient manpower is available for mop-up operations.

Fires burning on hillsides will burn rapidly toward the top of the hill. Protect exposures from streets at the top of the hill, but attack the fire from the bottom of the hill and work uphill. Changing wind conditions can rapidly fan the fire, trapping members on the hillside above it.

Attempting to break up heat waves using a water curtain generally is ineffective. Use streams to apply water directly onto exposures instead. Advance through burned-out areas to attack the fire. It is safe to operate from burnt-out, blackened areas as there is no fuel left to burn or reignite. Position apparatus to avoid blocking roadways, leaving access for other apparatus to pass.

Units responding to brush fires may encounter fires extending by brands a distance from the original location. These should be reported via radio to the dispatcher for relay to the Incident Commander (IC). These should not be treated as separate inci-



A team of Firefighters--equipped with an Indian pump and broom--extinguish spot fires ahead of the main fire.



Application of water at brush fires should be directed at the base of the burning vegetation, not at the spectacular burning gases above the brush.

dents and should be handled either by assigning units from the staging area or requesting additional units or complete additional alarm assignments as needed. When these are treated as separate incidents, it generally results in confusion in assignments, overloading the radio networks and ineffective coordination.

Bog fires generally are smoldering underground with no obvious extension hazards. They often result in nuisance smoke conditions, prompting numerous calls. Slower operations can be undertaken for bog fires. This may require burrowing holes in the bog, inserting lines and flooding, using large amounts of water beyond saturation. Bog fires can go on for days.

Units not protecting exposures or operating in a position to effectively extinguish fire should be released to the Command Post for reassignment or returned to staging.

Communications at large brush fires are difficult because units may be spread out over a large geographic area, possibly beyond the range of handie-talkies. Designate a Resource Unit Leader early in the operation or it will be difficult to control communications. Consider special-calling the Field Communications Unit to assist.

Additional Sector Chiefs will be required when units are operating over a wide geographic area. Special-call a sufficient number of Chiefs early in the operation to avoid being overwhelmed. Assign Sector Chiefs to locations where exposures are endangered. In areas with roads, but no hydrants--such as on limited access highways--consider using engine companies to provide quick knock-down using their Stangs and booster tanks, then refilling at a hydrant and returning.

Off-road operations

Standard pumpers are not designed for off-road operations or to drive on soft ground. They are too heavy and may bog down. Before taking any apparatus off-road, carefully consider the risk versus reward. Use extreme caution when taking any apparatus off-road. A bogged-down apparatus may become an exposure problem, requiring a commitment of units to protect it. Additionally, a bogged-down apparatus will require a large commitment of trained personnel and specialized vehicles, as well as a time-consuming operation to extricate it.

When taking any apparatus off-road, have members precede the apparatus on foot to determine conditions. If in doubt, do not proceed. When necessary to operate off-road, preference should be given to four-wheel-drive brush fire units and all-terrain vehicles (ATVs) designed for off-road operations.

Safety considerations

All members operating at brush fires must wear proper personal protective equipment, including helmets. This equipment not only protects from radiant heat and burns, but also offers protection against contact with poison vegetation, mosquito bites, abrasions from brush and trees and ticks.

There are many safety concerns to be considered. Brush fire operations are labor-intensive and require frequent relief and rehab of operating personnel. Be alert for abandoned wells, cesspools and other holes, sometimes covered with rotted wood coverings.

All body parts should be covered; especially hands, since thorn punctures can become infected. Contact with poison ivy, oak, sumac or other vegetation can lead to painful rashes. Keep exposed skin covered.

Avoid walking through piles of rubbish or lumber to avoid nail punctures. When crossing creeks, be extremely cautious of wood bridges or lumber stretched across the creek. These likely are rotted and unable to support weight.

Avoid attempting to jump across creeks. Use portable ladders as a bridge. When on foot, maintain a distance between members to avoid tree/brush limbs from snapping back on the following member. In cold weather, do not step into the footsteps of the member ahead of you in marsh areas because the hard surface may have been broken and no longer will support weight. Do not walk on frozen creeks, ponds or lakes. Avoid contact with wildlife. Use extreme caution when brush fires burn near utility transmission lines. Never operate hose-lines beneath high-voltage lines. Request power off from the utility company if high-voltage lines could be or are exposed to fire.

Forestry hose

Forestry hose--lightweight, yellow, one-inch plastic hose--is designed specifically for brush fire operations. This hose is highly maneuverable, but is restricted to brush fire operations. It is not to be used for structural, rubbish or junkyard fires. Forestry hose is carried by Staten Island engine companies and all brush fire units.

Brush Fire Units

Brush fire units should be operated by trained personnel from the host engine company for efficiency, knowledge of the apparatus' limitations and accountability. Proper aggressive use of brush fire apparatus can equal the equivalent of an additional alarm assignment. Brush fire units are staffed independently on day tours during brush seasons. However, brush fire units are always in service, cross-staffed by their host engine company when not independently staffed.

Currently, there are two different types of brush units. There are three smaller units built on pick-up truck chassis that have 160-gpm pumps and 225-gallon tanks. There are also five larger units, equipped with 500-gpm pumps and 500-gallon tanks. All brush units are equipped with four-wheel drive and have a winch. The winch is designed for self-extrication, but can be used to extricate a similar-sized vehicle.

Brush units can be used to resupply Indian pumps without removing units from operating positions. The brush units are not tanks; they cannot knock over trees or go through hedgerows, but can operate off-road effectively when operated by trained personnel. Brush units can be supplied with a hose-line to operate from a stationary position. They also can be used to patrol areas suscep-

tible to brush fires to detect and extinguish fires in the incipient stage.

ATVs

Currently, there are two ATVs (located with Engines 154 and 164, with Engine 160 as a back-up) with brush fire capabilities. They are transported to the scene on a flatbed truck. They have limited fire-fighting capabilities: a 20-gpm pump and a 70-gallon water tank. They are equipped with a booster reel and carry forestry hose, nozzles and Indian pumps. They can be supplied with a 1³/₄-inch line for continuous operations. Their advantage is in their size; they are light and maneuverable and can get into areas that the brush fire units cannot. The ATVs also are equipped with a stokes basket and can be utilized to remove injured members from remote areas.



Proper use of brush fire units can be an effective tactic at large, inaccessible brush operations.

Satellite Units

The satellite unit can be used to advantage at brush fire operations. There are six satellites. Use of multiple satellites is dictated by the Incident Commander's strategy. The five-inch, large-diameter hose can be used as a portable water main, bringing a substantial water source into remote areas. Its manifold can be utilized at a remote location to supply multiple hand-lines and its large-caliber Stang can be employed to knock down fire or protect exposures.

Portable pumps (dewatering pumps) have limited capabilities, but can supply a hand-line, especially from remote streams or ponds where stretching a long line would be labor-intensive. These pumps are carried by the brush units and many other companies. Units responding to large-area brush fires--especially those remote from roadways--should consider this tactic. Another use for these pumps is from small boats carried by the rescue companies or tactical support units. An effective stream can be developed, which will knock down a substantial amount of fire.

Observation Post

At large-area brush fires, one of the first actions should be to raise a tower-ladder for use as an observation post. This should be staffed by one of the first Chief Officers on the scene. From this vantage point, it is easier to determine the size of the fire, exposures and fire travel than from the ground.

The raised tower also serves as a reference point for units whose members may be obscured by operating in the brush. To identify units, call them on the handie-talkie and have members raise their brooms or operate their hose stream into the air.

NYPD helicopter operations

When requesting the NYPD helicopter, keep in mind that reflex time is usually 20 to 30 minutes at a minimum. The helicopter will not fly in winds greater than 40 mph, the weather most ideal for brush fires. The helicopter also has limited operational time, generally one hour, including travel time.

The main advantages of using the NYPD helicopter are for air reconnaissance and control of operating forces, not for firefighting. The Bambi Bucket--a device used to drop water on the fire--has a 150-gallon capacity and limited effectiveness. All members operating in the area of the water drop must be removed prior to the drop.

Members are urged to review the following WNYF articles:

- "Special Apparatus: FDNY Brush Fire Units--Useful at Other Operations, Too," by Battalion Chief John A. Calderone in the 4th/97 issue.
- "Six-Alarm Brush Fire in Douglaston, Queens," by Deputy Chief Michael Giovinazzo, in the 3rd/2000 issue.

Often, a portion of the water drop is taken by the wind and does not reach its target. Members cannot be recommitted to the drop area until advised by the Air Recon Chief that water drop operations have been concluded. Helicopter operations might be an alternative to committing personnel to dangerous/remote locations.

Water used in these operations is taken from the nearest available source and may be polluted. Rotor wash from low-level operations in the past has significantly fanned the fire. Consider reflex and operating times and limited capabilities of the Bambi Bucket against further extension and ultimately a greater commitment of FDNY resources. It may be better to commit those resources earlier. A properly positioned and utilized brush fire unit has more water and will be more effective than helicopter water drops. Limited water capacity equals limited effectiveness.

Other resources

The National Park Service operates several brush fire units in the park areas that are part of Gateway National Recreation Area. They generally have the same capabilities as FDNY brush units. Several of the volunteer fire departments still operating within the City operate four-wheel-drive apparatus that may be helpful at brush fire operations.

The Department of Sanitation has street-flushing trucks that are essentially water tankers. These may be useful as remote water sources, but reflex time for them is prolonged. A supervisor must respond first to evaluate the request and, if approved, a crew then must be assembled. In general, this is not a practical consideration for fire operations.

Note: AUC 151 will be updated soon and reflect the new information contained in this article.

About the Authors...

Deputy Chief James Leonard (top) is a 28-year veteran of the FDNY. He is the Division Commander of Division 8. He holds both AAS and BA degrees from St. Francis College. He is a graduate of the Fire Officers Management Institute (FOMI) at Columbia University. **Battalion Chief John A. Calderone** (bottom) has served the FDNY since 1973. He is assigned to Battalion 22. He holds a degree in Fire Protection from New York City Community College and has written extensively on the subject of fire apparatus. They are frequent contributors to WNYF.

