

# **Rocky Mountains**

# ROCKY MOUNTAIN

## I. INTRODUCTION

Since it is very difficult to be familiar with all the fuel types in North America and special circumstances common to specific geographic area, Incident Management Teams, crews or single resources coming into the Rocky Mountains, or any other unfamiliar area, should make it a point to secure a knowledgeable local individual to advise the team on local weather, fuels, fire behavior, and other safety and management considerations. This individual will prove invaluable to the team during the course of the management action.

## II. ROCKY MOUNTAIN – OVERVIEW OF WEATHER, FUELS AND FIRE BEHAVIOR

### A. Topography

The Rocky Mountains extend over 3000 miles from Northwestern Alaska to Northern New Mexico and is the largest mountain range in North America. Within this area are some of the most inaccessible mountains in the United States. Most of this mountain range is oriented north and south with the Uinita Mountains in northeastern Utah being the only exception. A wide range of life zones (prairie, foothills, montane, sub alpine, and alpine) found in the Rocky Mountains reflects the influence of altitude and latitude on climate.

The Northern Rockies of Canada and Montana are heavily glaciated and support extensive coniferous forests. Two major drainages, the Salmon River and the Snake River, both exceptionally deep canyons, flow through this region. Both of the canyons exhibit hazardous fire suppression conditions because of steep slopes, side canyons and inaccessibility.

The Southern Rockies have nearly 900 peaks above 11000 ft and contain three-quarters of the landmass above 10000 in the contiguous United States. Forests in the Southern Rockies and may be more open and are often limited to mountainsides because of low precipitation amounts in the valleys.

### B. Weather

The Rockies can be divided into two climatic zones, the Northern Rockies and the Southern Rockies. The northern Rockies extend from Alaska's Brooks Range to central Wyoming and include the Cariboo, Monashee, Selkirk, and Purcell Mountains of Alberta and British Columbia, the Bitterroot Mountains of western Montana and Idaho, and the Teton, Big Horn, Absaroka, and the Wind River range of Wyoming. The Southern Rockies extend from Central Wyoming into New Mexico.

The Northern and Southern Rocky Mountains share a typical continental climate with large daily and seasonal temperature ranges. The winters

are cold; the summers are moderately warm and dry with frequent thunderstorm activity.

Northern Rocky Mountains: The majority of precipitation is received in winter in the form of snow and rain, depending on elevation. March is quite often the heaviest precipitation month. The fire season usually extends from June or July through September. This is a region of extreme weather conditions, especially east of the Continental Divide. In the summer low-pressure storms travel rapidly across the region from west to east, setting off isolated afternoon thunderstorms. These thunderstorms move rapidly and produce only light precipitation. The first significant moisture during fire season usually occurs in late August or early September.

Catastrophic fire seasons usually begin with long-term drought conditions. Notable fire years are 1920, 1919, 1934, 1960, 1967, 1988, 1994, and 2000. The synoptic weather types producing high fire danger, are similar to those described for the Great Basin. Particularly important are the ridge aloft patterns, which produce warm, dry weather, and high-level thunderstorms.

Extreme fire movement occurs with the passing of dry cold fronts, usually in late summer (from August on) and early fall. Easterly-orientated valleys are particularly susceptible to the west and southwesterly winds associated with these fronts. Winds associated with the passage of thunderstorms can be erratic for short durations and often significantly effect fires.

Chinook winds, a foehn wind on the eastern slopes of the Rocky Mountains, often result in extreme fire movement due to the high winds associated with this phenomenon. This condition, which occurs in the late summer, fall and winter, moderates temperatures and is effective in bringing subsiding air to the surface.

The formation of thermal belts in mountainous terrain is common to the Northern Rockies. Relative humidity often remains below 30% for extended periods of time, contributing to the drying of fuels and active fire behavior at higher elevations throughout the night. Below the thermal belt, fire behavior is benign because of cool, humid, and stable air.

Southern Rocky Mountains: The majority of precipitation is received in winter in the form of snow and rain, depending on elevation. March is quite often the heaviest precipitation month. However, along the Front Range foothills of Colorado, east of the Continental Divide, at lower elevations, the majority of precipitation comes in form of rain during the late spring/early summer months. In this area, May is usually the heaviest month of precipitation. This condition sometimes, although not always, results in lower elevations experiencing a facsimile of a split fire season. When early springtime conditions remain dry, fast spreading fires can be supported by dry vegetation in late March and early April. The occurrence of this situation diminishes with late spring plant growth but returns in July and persists throughout the fall or until the first snowfall.

The Southern Rocky Mountain area is predominantly affected by storms tracking from the west and southwest into Colorado and traveling to the northeast. The extreme southern portion of the state will receive an influx of monsoon moisture from Arizona and New Mexico during July and August. Occasionally, a low pressure in northeastern New Mexico or the panhandle of Oklahoma will cause an "upslope" condition along the Front Range. This is where the counterclockwise flow of air brings moisture from the south into eastern Colorado and directly into the Rocky Mountains from the east. This situation, however, is usually associated with high amounts of precipitation.

Thunderstorm frequency increases as the summer progresses. Thunderstorms begin in late May and persist until mid-August, then drop dramatically in occurrence. Winds associated with the passage of thunderstorms can be erratic for short durations and often significantly effect fires.

Chinook winds, a foehn wind on the eastern slopes of the Rocky Mountains, often result in extreme fire movement due to the high winds associated with this phenomenon. Dry cold fronts and associated high winds will frequently affect active fires.

#### C. Fuels and Fire Behavior

Vegetative structure and composition in the Rocky Mountains are closely related to elevation and precipitation variances. Temperatures increase and precipitation decreases as elevation decreases causing fewer occurrences of woody tree species and greater dominance of woody shrubs and grasses. These vegetative communities contain lower fuel quantities and tend to support fires with rapid rates of spread but of short duration. Containment actions are less rigorous than for heavier fuel types and mop-up activities are minimized.

As elevations increase, temperatures drop somewhat, precipitation amounts increase, and vegetative types show a shift to forest communities. These communities possess greater quantities of fuel, both alive and dead. Slower rates of spread are common for fires in these areas, but intensities can escalate dramatically and burn out of residual fuels after passage of the flaming front can be of long duration necessitating extensive mop-up actions.

The following sections provide a description of *major* vegetative types of the Rocky Mountains and their influence on fire behavior.

#### **Grasslands:**

**Description** Both perennial and annual grasslands are present in the Rocky Mountains. Perennial grasslands are found along the full elevational gradient in the form of extensive grasslands at lower elevations to mountain meadows at higher elevations. Annual grasslands are comprised of cheatgrass and are smaller pockets in the western portions of the area. Perennial grasslands in the western portion are

comprised of bunchgrasses and forbs but do not form continuous fuel beds. Sod grasses of the short grass prairie represent perennial grasses in the eastern portion of the region. In all areas, cured grasses can present highly flammable fuels, particularly in areas not grazed or subject to winter livestock use.

**Fire Behavior:** In a cured stage for both annual and perennial grasses, rates of spread can be high but fires are relatively easy to control. Cheatgrass stands pose particular concerns because they reach a cured stage very early in the summer and remain very flammable throughout the fire season. With high temperatures, low relative humidities, and strong winds, fires in grasslands can produce flame lengths far in excess of what can be direct attacked with hand tools and rates of spread that are very high. Safety is a particular concern in these situations and escape routes and safety zones are few and when present must have quick accessibility. Shortgrass prairie areas become flammable early in the year (as early as March) and remain in that state throughout the summer. In the absence of thunderstorm rainfall, these areas can sustain significant fire activity although the duration is very brief.

### **Sagebrush-Grass:**

**Description:** This dry steppe community occupies large areas within the Southern Rocky Mountains and can be found as a component of other vegetative communities including the pinyon-juniper, montane conifers, aspen and subalpine lodgepole pine communities. Sagebrush is by far the dominant species with associated species including: rabbit brush, bitterbrush, snowberry, other sage species, various annual and perennial grasses, and forbs. Species composition increases with elevation and precipitation. Fuel volumes will vary significantly depending upon the site, its moisture regime, and grazing influences. Under moist conditions, sagebrush can attain a height of 8 feet, but 3 - 4 feet is the norm.

**Fire Behavior:** In areas where livestock grazing is deferred, where winter grazing is managed for, or at higher elevational zones, summer conditions include high amounts of understory grasses and forbs. This fuel continuity strongly contributes to surface fire spread. In areas where this surface fuel continuity does not exist, wind is required to move fires between individual sagebrush plants. Fuel models 2 and 5 represent fuels in this type. Flame lengths usually vary from 3 - 20 feet with rate of spread being strongly affected by terrain and wind. Heading fires are most common and nighttime humidity recovery usually reduces burning activity. Thermal belts will maintain an active fire. Spread rates are high and burned areas can reach 1 to 5000 acres in a single burning period. With critical conditions, burned areas can go much larger in a single burning period. Seldom are wind events sustained for more than two consecutive burning periods, thus the size and duration of fires in these communities are limited.

### **Pinyon-juniper:**

**Description:** Pinyon-juniper communities cover large areas in the Southern Rocky Mountains but do not extend north of Colorado. These

woodland communities occupy a transitional zone between sagebrush communities and oakbrush communities or higher elevation montane conifer forests. Pinyon is the dominant species as elevations increase and juniper assumes the dominant role at lower elevations. Associated species found in this zone include sagebrush, other woody shrubs, grasses, and forbs. Generally understories are sparse with this conditions escalating the older the stand is.

Young stands commonly have a large understory component, usually dominated by sagebrush and other shrubs. Distinct differences occur east and west of the continental divide. On the west slope, pinyon-juniper stands are very dense old-growth having large quantities of down and dead material. Many stands have established on mesa tops and achieved near optimal growth. In other areas, these species are encroaching into shrub-grasslands in the absence of recurring fire. Understories are comprised of a dominant shrub component. On the eastern slope, pinyon-juniper stands are only found in the southern half of this area and experience substantial thunderstorm precipitation during the summer. This situation in combination with the understory composition of short grass prairie sod grasses and no shrub component causes low intensity, small wildland fires with only an occasional problem fire occurring.

**Fire Behavior.** Fire behavior fuel models 2 and 6 best represent this community. Sparse understory vegetation strongly controls the ability of these communities to support surface fires. Fires burning out of another fuel type into this one can travel into it in surface fuels but seldom can sustain this for very long. The arid nature of the environment combined with the small stature of these trees makes total crown closure a rarity, thus when crown fires do occur, they are totally dependent upon strong winds to sustain their existence. High quantities of dead and downed fuels in old stands, high quantities of resin and pitch in pinyon trees, and low moisture contents of juniper trees as well as their shreddy bark make this woodland zone a very flammable situation. In the presence of strong winds, 25 - 50+ mph, independent crown fires occur that can cover large areas, 1000 - 3000 acres, but natural barriers and fuel changes are common and limit spread. Spotting can be a problem but without wind can be easily dealt with. Seldom do more than three consecutive burning periods occur with high wind conditions, thus wildland fires in these communities are relatively short-lived. Wind is the key element in these communities and fires are either a single tree, low intensity event, or a wind-driven, high intensity event covering large areas. Many National Parks and Monuments are located within this vegetation type. Fast moving, high intensity fires are difficult to suppress and pose serious threats to communities and other developments. This is not a fuel type to be taken lightly. Serious fire behavior can occur when the understory burns in combination with the overstory or when wind-driven situations occur and fire moves through the overstory. Some particularly troublesome examples include the Battlement Creek fire (1987), Battlement Mesa fire (1985), Long Mesa fire in Mesa Verde NP (1989), Chapin 5 fire in Mesa Verde MP (1996), and South Canyon Fire at Glenwood Springs, CO (1994).

### **Oakbrush:**

**Description:** This vegetative type is unique to this geographic area. It is found in warm, moist environments mostly west of the continental divide. In its northern limits, it can be found as pure stands or mixed with other tall shrubs as a mountain shrub zone. In its southern limits, it can be present in a pure community or as a dominant understory component of aspen or ponderosa pine stands. Oakbrush can tolerate fire extremely well and can respond with 18 - 24 inch sprouts during the same season it was burned, depending upon moisture conditions, etc. As an overstory dominant or in pure stands, it can reach heights of 10 - 12 feet but is usually in the 3 - 6 foot range. As an understory dominant, it ranges in height from 2 - 4 feet. It grows as a dense clump with an understory of total ground cover in the form of grasses, sedges, and forbs. Other shrubs can be present and include: chokecherry, serviceberry, mountain mahogany, snowberry, gooseberry, rose, greenleaf manzanita, and others.

**Fire Behavior:** Fire behavior in oakbrush stands can be variable, depending upon many factors. Fire behavior fuel models for this type can include 2, 4, and 6. Live fuel moisture levels reach their lowest about the end of July. These levels correspond to the fuel moisture of cheatgrass, very dry. Fires commonly occur during July and August with intensities varying. Flame lengths frequently exceed the limits for direct attack with ground forces. Special conditions occur in this fuel type that warrant close attention. When late season frosts occur after leaves have developed, frost-killed leaves can remain on the shrub throughout the remainder of fire season. Following new leaf growth, flammability can be greatly increased, to the level of California chaparral. Fires occurring during these situations can exhibit high intensity, rapid rates of spread, and can develop into crown fires very quickly. Steep drainages where preheating can occur during the morning and early afternoon are particularly dangerous places. In 1976, within a two hour period, a benign appearing fire (Battlement Creek) quickly grew into a rapidly moving crown fire that traveled from the bottom of a drainage to the top on 50 to 70% slopes and over the ridge point at nearly 100 chains/hour. Flame lengths were 20 - 40 feet and this fire resulted in three fatalities. Fires in these communities can be affected by winds and by slopes or by either one in absence of the other. Crowning runs can develop during consecutive burning periods and prolong suppression actions. Of particular importance is the fact that a fire can remain active in the leaf litter understory during the night and back down slopes and then travel through the overstory back upslope during the day, in a reburn scenario. Also important is the fact that a fire may show no appearance of activity and quickly come to life during the peak of the burning period and make a significant and threatening run. Mop-up to reduce the potential of this occurring is extremely important.

### **Ponderosa pine/Douglas-fir:**

**Description:** These montane communities comprise a significantly important portion of the Rocky Mountains and are comprised of ponderosa pine, Douglas-fir, occasional lodgepole pine, and isolated

aspen trees. Understories vary significantly with drier sites having grass-needle understories to those having dense tall shrub understories in heavily shaded conditions. Historically fires burned frequently every 5 to 30 years but seldom killed larger trees. Fuel complexes in these communities have been markedly altered in some areas through fire suppression, grazing, timber harvesting, and insect and disease occurrence. Open stands having low accumulations of down and dead woody materials have been changed to areas characterized by numerous dead overstory trees, shade tolerant regeneration abundant in the understory, heavy accumulations of surface fuels, and high vertical and horizontal fuel continuity. In some instances Mountain pine beetle and Spruce bud worm infestations on the east slope have left entire hillsides with standing dead trees representing significant snag hazards.

**Fire Behavior:** Fire behavior in these communities ranges from low intensity surface fires in needle-grass fuels to all types of crown fires. The specific fire type that will occur is dependent on the fuel availability; fuel quantities, environmental conditions, topographical conditions, weather conditions, and present stand structure. All types of fires (heading, backing, flanking, crown) can occur with active burning possible throughout nighttime periods and sustained by thermal belts. Of special concern is the speed with which a fire can change from a benign surface fire to a fast-moving, high intensity, crown fire. Safety considerations regarding this potential are paramount and fire behavior predictions are an extremely valuable part of incident action plan development and implementation.

### **Lodgepole Pine:**

**Description:** Lodgepole pine forests comprise the second largest forest type in the Rocky Mountain area. Understory fuels are sparse or nearly absent in this vegetative type. Historically stand replacement fires burned every 100-200 years in this vegetative community. Stands are even-aged unless infected by disease, which causes early overstory mortality and opens canopies for regeneration. Fuel complexes have often been affected by insect and disease infestations. Mountain pine beetles have infested widespread areas. Dwarf mistletoe infection represents the most significant disease in lodgepole pine and is present in many stands. This disease has caused enough mortality in some stands that predictive fuel models have changed from model 8 to model 10 and downed fuel loadings have increased from 5 - 10 tons/acre to as high as 75 - 100 tons/acre. Large amounts of standing dead trees are present and pose significant snag hazards to firefighters.

**Fire Behavior:** Wildland fires can be very intense and fast moving in these communities. Some important points to be aware of are that the lowest live fuel moisture contents of the year occur immediately prior to bud break and some of the largest fires have occurred at this time (early June). In stands unaffected by insects or diseases, surface fuels seldom support much fire activity. Overall stand flammability varies with age as young and very old stands are the most flammable and immature to mature stands are much less flammable. Stands affected by insects, diseases, and fire suppression can have greatly increased fuel loads and

exhibit all types of crown fires, especially supported by the surface fires. Reburning over previously burned surface areas is a possibility and residual burnout of downed fuels prolongs suppression activities. Under conditions of high winds, fires can cover large areas in short time periods. Since lodgepole pine is a fire dependent species, its presence and appearance is an indication of past fire activity and fire behavior.

### **Subalpine communities:**

**Description:** This fuel type covers extensive areas at mid to high elevations within the Rocky Mountains, but fires that do occur here are often difficult, and expensive to suppress. High elevation communities are comprised of Engelmann spruce and subalpine fir, with some lodgepole pine present. Historically stand replacement fires burned every 200-500 years. Surface fuels can be minimal in open grown stands or very heavy, predominantly large down tree stems, in closed canopy stands. Tree limbs of both species of trees usually are present all the way to the ground, posing good vertical fuel continuity. In some instances Spruce Beetle epidemics have resulted in extremely high tree mortality. The relatively high elevation of these areas has inhibited tree decomposition and the present forest is one of regeneration coupled with large quantities of standing dead trees in the form of large snags, and heavy surface fuel loadings. Fires in this area are extremely difficult to control, pose logistical problems, necessitate wilderness camps, and pose extreme safety hazards to firefighters while on the line and in camps.

**Fire Behavior:** These stands often burn in patchy, spotty patterns best described as hundreds of spot fires. Regular line construction and burn out efforts are ineffective on fires in this type. Spread is by torching of individual trees or groups of trees with spotting into more individual trees downwind. These fires have the potential to wear crews out especially in low relative humidity situations with the constant torching and spotting into new fuels. Heavy down fuels, deep duff layers, and dense stands can make fire suppression a very laborious process. Retardant is marginally effective. The key to suppression in this type is having crews limb up all trees with fire under them, to remove the ladder fuels and stop the torching and spotting into new fuels. Once the spread is stopped, water from pumps, engines, portable tanks, and bladder bags can be used to speed up the mop-up in deep duff and heavy downed material under the trees. In heavy bug-killed areas, slash fuel models (12-13) are appropriate for fire behavior predictions.

## **III. WILDLAND FIRE MANAGEMENT OPERATIONS IN THE ROCKY MOUNTAINS**

### **A. Strategy**

Both the Northern and Southern Rocky Mountain Areas contain a full extent of resource values at risk, fuel types, and terrain features. Appropriate strategies utilized during suppression activities will vary depending upon the specific set of conditions for a particular incident.

Firefighter and public safety will be the dominant factor shaping strategy in the Rocky Mountains. The Wildland Fire Situation Analysis (WFSA), the Wildland Fire Implementation Plan (WFIP), and Delegation of Authority will define Line Officer expectations.

### **Direct attack:**

Generally speaking, on most fires within Rocky Mountains lower elevation fire communities (pinyon-juniper and northern desert shrub-sagebrush), direct attack with the one foot in the black is the preferred strategy. Direct attack is also effective for higher elevational fuel types depending on fire intensity.

Water and retardant can effectively stop the fire spread. If rekindling occurs, it will happen over a short period of time due to light fuels. Cold trail when possible to avoid reburns and escapes. Direct attack reinforced by a hoselay with laterals every 200 feet is very effective in most fuel types. Aerial retardant is effective in direct attack for establishing line and also for tying engine lines together. Foam units are becoming more common and can be very effective in lighter fuels. The direct attack method is limited by the following:

- Ability to work close-in to the fire (fire intensity), size of perimeter, and number of resources available.
- Availability of water.
- Terrain (accessibility and maneuverability).

### **Indirect attack and Parallel attack:**

Indirect and parallel attack and burning out is a good approach in areas where minimizing burned area is not a significant concern. Indirect and parallel attack also becomes an option when direct attack is limited due to erratic, severe or extreme fire behavior (Presence of fire whirls, prolific crowning and/or spotting, very high to extreme rates of spread, or presence of a tall and well-developed convection column). Indirect attack is also used in higher elevation fuel types to stop the spread of crown fires.

Locate control lines as close to the fire's edge as possible. Fuels should be turned out as line progresses or as quickly as favorable conditions exist. When using an indirect attack, several factors must be considered:

- Natural barriers.
- Roads.
- Burned acreage.
- Timing - can burn out be completed prior to fire spread reaching predetermined line?

- Availability of resource for firing and holding.
- Methods available to prepare burnout line.

Methods of preparing burnout line that have proven effective include:

- Wet line with immediate burnout.
- Engine applied retardant or foam line.
- Air tanker or helitanker applied retardant line.

**NOTE: Indirect lines have to be fired out immediately. CARRY YOUR FIRE WITH YOU!** Time is critical and ground and aerial based ignition devices can be highly effective. Terra torches mounted on four wheel drive vehicles offer high utility while aerial devices including the helitorch and plastic sphere dispenser both provide a rapid firing method.

Ground firing by hand is much slower but also effective.

### **Wilderness**

Suppression actions and techniques must be selected and implemented to result in the least impact on the Wilderness resource leaving the least possible long-term evidence of human activity. The Wilderness Act defined Wilderness as an area; "...to be affected primarily by the forces of nature with man's work substantially unnoticeable..." Fire suppression actions in Wilderness shall be those which achieve the Wilderness protection objectives, with minimum adverse impacts on the Wilderness resource.

It is appropriate to accept moderate risk of fire escape associated with the use of confinement/containment strategies. The effects of fire on the Wilderness resource are most often more acceptable than the adverse effects of a control strategy or direct attack. The key is to balance suppression impacts with risk, which will vary in each fire situation (seasonal severity, threat to adjacent management areas/objectives, potential cost/lost).

### **B. Tactics**

The full spectrum of tactics is available and will be called into play in these geographic areas. As resource values to be protected increase, tactics will implement a more aggressive and productive capability of suppression resources.

Common tactical considerations include:

- Night operations - can be highly effective, but pose potential risks to personnel.
- Use of natural barriers/fireline location.

- Chemical retardant use and limitations on use.
- Burnout, aerial and ground ignition.
- Coyote tactics.
- Minimum Impact Suppression Tactics (MIST) - should be standard procedure on all wildland fires but will be mandatory in all wilderness areas.
- Minimum impact rehabilitation techniques.
- Mop-up standards.
- Helispot location and rehabilitation.
- Safety concerns/snag problem areas/evacuation needs.

Sometimes it is necessary to construct a fireline downhill. This is a hazardous practice when done in fast-burning fuels and steep topography, because of the danger that the fire may cross the slope below the crew and sweep uphill to trap them. A fireline should not be built downhill in steep terrain and fast-burning fuels, unless there is no suitable alternative for controlling the fire; and then only when ALL safety requirements are adhered to.

Air Operations. In addition to the aviation considerations listed for the northwest are, the following should be considered for the Northern Rocky Mountain area:

- Inversions at night will hold smoke in valleys until mid or late morning and make air operations doubtful.
- Air tankers have a low priority on large fires. In appropriate situations, aerial retardant can be effectively used for tactical support to line crews (holding action on small fires or spot fire containment).
- Paracargo for resupply for remote camps is an option.

Canyon Country. A parallel or flanking strategy usually works best tied into good anchor points.

Tactical Considerations:

- Make sure you use a lead plane with air tankers for best result.
- Let fire come to the top, rather than build line downhill.
- Maximum, aggressive effort at night is usually successful. Make sure operation overhead and crew bosses working the night operational period have seen their division in daylight.
- Burnout is preferred to backfiring.

- If you are building line from the ridgetop to the bottom, find a side ridge that goes all the way. Burnout as you go, leaving a good clean edge with a solid black line.

Camps are often necessary to implement a strategy and are effective in reducing the fatigue of crews. If travel time from the base camp to the fireline exceeds one hour, seriously consider division size camps. (Camps are recommended, rather than helicopter crew movements.)

Coyote Tactics are sometimes necessary because of logistics. If Coyote tactics are established they are often supplied with helicopter long lines. Timing of load, adequate water, and food are critical.

Fireline explosives enable a five-person team to construct fireline at rates of 80 chains per hour in timber with moderate fuel loadings with less environmental impact than conventional methods. The quality of line constructions varies with fuel types. Nearly complete line can be made in light brush, grass, and timber. Heavier fuel concentrations will require follow-up sawyers.

#### a. Suppression Resources

Engines are the primary tool in the Southern Rocky Mountains and are used where terrain allows in the Northern Rockies. Most engines are four wheel drive and range in size from 100 to 1000 gallons in capacity. Foam and retardant capability is becoming common on most engines.

Heavy equipment: bulldozer use has decreased in recent years due to environmental considerations but still remains a viable tool when warranted. Feller- bunchers have been used to construct firelines in standing timber.

Hand crews: Hand crews are the most common resource utilized on extended attack and team-action wildland fires in the Northern Rocky Mountains.

Aircraft: Helicopters are effective for reconnaissance, personnel movement, initial attack support, supply transport, and water or chemical delivery. Airtanker use in the Rocky Mountains is moderate and the primary use is for initial attack and high value protection. There are numerous airtanker bases throughout this area with the capability for operation of portable refill bases to support large fire suppression activities as needed.

#### b. Dispatch Coordination

The Rocky Mountains represent all or portions of three distinct geographic areas

Dispatch coordination within these areas functions through four separate Geographic Area Coordination Centers (GACC). These are shown in the following table.

Table 1. Dispatch coordination system for the Rocky Mountains.

<b>Northern Rocky Mountains</b>	<b>Area Covered</b>
Eastern Great Basin Coordination Center (EGBCC), Salt Lake City, UT, Northern Rockies Coordination Center (NRCC), Missoula, MT	Utah, southern Idaho, and western Wyoming, northern Idaho, Montana, and North Dakota
<b>Southern Rocky Mountains</b>	<b>Area Covered</b>
Rocky Mountain Area Coordination Center (RMACC), Broomfield, CO, Southwest Area Coordination Center (SWCC), Albuquerque, NM	Colorado, Wyoming, South Dakota, Nebraska, Kansas, New Mexico, Arizona

Each area has a system of interagency dispatch centers that provide coordination at the local level within the area center of concern.

#### IV. CONSIDERATIONS INFLUENCING OPERATIONS

##### A. Safety Considerations

1. **Snakes, scorpions, insects, and bears.** The Rocky Mountains provide the opportunity for unfortunate encounters with a variety of life forms. Special safety instructions should be provided to ensure personnel safety.
2. **Access.** Generally, four wheel drive vehicles can move over terrain. Some rock outcroppings, steep sided gullies, cliffs, and underground arroyos pose special hazards at night. Loose soil types and rocks can high center vehicles quickly.

Foot travel can be difficult. Sprained and broken ankles are possible. Vegetation and steep terrain can be difficult to move through. Rapid rates of fire spread and sudden wind changes create needs for crew awareness, safety zones, and escape routes.

3. **Fuel models.** As typical of fuel models described in "History of Fatalities and Near Misses," light flashy fuels have caused more fatalities than any other fuel models. Avoid complacency, all fuel models support fire and fire is dangerous. Taking certain fuels lightly or placing insufficient emphasis on fire behavior can result in undesirable outcomes.
4. **Aviation.** High elevations and hot temperatures produce high density altitudes. Most fire activity is at or above a density altitude of 9000 feet. Helicopter and fixed-wing performance is reduced.

Military training routes and special use airspace (especially west desert Utah, southern Idaho, and all of Nevada).

Lack of water sources requires heavy water tender support if any major tactical water show using aircraft is planned.

Retardant is often ineffective in wind-driven fires.

5. **Water.** Due to high temperatures and direct exposure to sun, water consumption will be abnormally high. Up to two gallons of water per person, per operational period, is often necessary. This requires special efforts to get crews to carry enough water, it is a good idea to also make extra water available on the line. Dehydration is a serious problem if adequate water is not provided.

Potable water must be obtained from a safe source due to Giardia in many streams.

6. **Vehicles.** Because of the access and the fuel type, build-up of vegetation on the undercarriage of vehicles often occurs. Undercarriage fires are not uncommon, with fire being spread over a considerable distance before the driver is aware of a problem. Catalytic converters also present a potential ignition device whenever traveling across country.
7. **Volunteers.** Due to the remoteness of areas within the Rocky Mountains, local ranchers and other parties are often on the fire when a team arrives. This can present a serious safety concern. Volunteers should be released from the fire or provided the necessary personal protective equipment and close supervision, as quickly as possible.
8. **Adverse weather.** Rapid changes of temperatures from hot to very cold, often with moisture (sometimes snow) can pose a serious hypothermia threat to personnel. Planning should include visqueen to keep crews and equipment dry in the case of rain or snow, fuel for warming fires, and a place where wet, cold firefighters can be taken to dry out and warm up.

When utilizing camps, they should be equipped early on with plenty of visqueen and rations in case bad weather should prevent resupply by air, which happens frequently.

Of particular importance are Chinook winds. As they travel downslope, they pick up speed and frequently achieve speeds of 80 - 100 mph at the base of the foothills. These winds can drive any fire downslope regardless of the diurnal, upslope wind patterns and slope interactions (Ouzel Fire, Old Stage Road Fire).

9. **Medical Facilities.** Medical facilities are few and far between and evacuations for serious injuries will generally be by air.

10. **Snags.** Insect and disease caused tree mortality has created significant snag areas throughout the timbered areas of this geographic area. Teams should be aware of snag areas and take appropriate actions to minimize exposure to firefighters. Snag-related injuries have been increasing during the recent years.
11. **Terrain Features.** Unique terrain features such as the major river breaks (Salmon, Snake) can pose specific problems. In these areas, steep slopes and dry fine fuels produce very fast moving fires. Special safety considerations are necessary here in that tactics may have to be modified in regard to crew placement, camp location, and crew movement. Use of coyote tactics can be common also. Numerous instances of shelter deployment have occurred in these river break areas (Ship Island, Butte, and Eagle Bar fires).

## B. Management Objectives

Type 1 IMTs can expect to encounter Wildland fire use (for resource benefits) assignments, either in combination with FUMTs or as an assigned responsibility.

Proactive involvement with local politicians and media is important and productive. The issue of land management and its relationship to fuels buildup is an extremely critical issue in the intermountain west.

## C. Resource Management Considerations

1. **Wilderness Areas.** Within the Rocky Mountains, there are a large number of wilderness areas under federal jurisdiction. Many of these wilderness areas support fire tolerant and fire dependent species and frequently experience wildfire. When assigned to a fire incident in these areas, teams can expect to be placed in a range of capacities from an advisory capacity to the local unit to a suppression management capacity. When charged with suppressing the fire, additional constraints will face the team. Minimum impact suppression tactics and rehabilitation techniques will have to be adhered to. Helispot construction and rehabilitation techniques may have to be modified.
2. **Livestock grazing allotments and critical winter ranges.** In the Rocky Mountains, single fire events can destroy all available forage on a permittee's allotment, thus threatening his/her business and livelihood. Many of the shrub zones in the Southern Rocky Mountains are critical to big game species for providing winter habitat. Fires can destroy this habitat and have a dramatic and immediate impact on big game populations.
3. **Anadromous Fisheries Habitat.** With the decline in salmon fish populations, guidelines have been developed for fire suppression actions in salmon habitat areas. This information is critical in developing suppression strategy and tactics and must be closely adhered to.

4. **Noxious Weeds** Non native forbs and grasses can pose significant negative economic impact. Special actions may be necessary to limit the introduction of these species through suppression operations. Local resource advisors should be consulted to obtain information on procedures to limit the spread of these species.
5. **Cultural and Historical Resource Considerations.** Throughout much of the Rocky Mountains are concentrations of cultural and/or historical resources. These resources will require maximum protection from damage from both the fire and the fire management actions. These resources will affect the range of strategy and tactics that the IMT can employ and will be provided to you as constraints from the Agency Administrator. Use of Resource Advisors is critical to remaining consistent with the Agency Administrator's direction and the constraints.
6. **Smoke impacts** near urban areas can be a real concern from both a visual and health standpoint. Large, long duration fires can also have significant impacts on local economies.

#### D. Urban-Wildland Interfaces

Wildland urban interface is present throughout the Rocky Mountains. Fire suppression in these areas can involve special considerations for communications, information, aviation, and smoke considerations. Most importantly, fire suppression in urban-wildland interfaces requires greater time and planning efforts. Urban and rural fire departments often have limited resources to draw upon.

#### E. Functional Considerations

1. **Logistics.** Logistics personnel need to plan for special considerations involving drinking water supply, communications needs, and delivery times for personnel, supplies, and equipment. Particularly important is the length of supply lines that are associated with wilderness fires. Quite often it is necessary to provide an additional individual to work with the expanded dispatch or receiving unit to ensure supplies are ordered and transported to the incident.
2. **Fire Behavior.** Due to the changes in fuel types, influence of weather, and time periods associated with fire behavior changes, it is critical to utilize a Fire Behavior Analyst on Incident Management Teams. Fire Behavior predictions and input to the planning process are vital to successful and safe suppression operations.
3. **Information.** Providing public information to media sources as well as to agency administrators is critical to successful operations. Of special consideration is the fact that urban-wildland fires can occur in close proximity and within view of major metropolitan areas (Denver, Salt Lake City, Missoula, Boise, Helena) and teams can quickly be inundated by news media. It is imperative for incoming teams to plan ahead for additional staffing needs in the Information function. In

many smaller population areas, public meetings, media interviews, media tours, videotapes made by our personnel and sent to media outlets, bulletin boards can buy real dividends in local support for the agency and the fire suppression activities.

4. **Safety.** Safety considerations cannot be overemphasized. Changing fire conditions, personnel welfare, heavy use of aircraft, and snag problem areas must constantly be monitored. Avoid complacency.
5. **Operations/Air Operations.** Several important areas of concern for operational activities exist. First, since this area contains vegetation ranging from desert to alpine types, IMT's must be prepared to deal with fires burning in fuels represented by a wide range of fuel models, including 1, 2, 5, 8, 9, and 10. Secondly, limited access and rugged terrain, especially in the river break areas, may prohibit personnel placement and may require the placement above crews above fires on ridgetops or ridgelines. Downhill line construction may have to be considered but safety considerations must never be compromised. Thirdly, heavy reliance on aircraft, particularly helicopters, increases as remoteness increases. On most incidents, aircraft can account for 20% of total costs while on some wilderness incidents, aircraft costs can make up about one-third of the total suppression costs.
6. **General Organizational Considerations.** In many areas, ICS concepts allow for the escalation of incident management as the complexity and size of the incidents increase. This can equate to the transition from Type II to Type I teams. In many areas of the Rocky Mountains, wildland fires that escape initial attack, instantly become Type I incidents due to the complexity, land ownership, and location of the incident. In these situations, the team will be faced with the time lag associated with their mobilization and the potential lack of additional overhead to absorb into the Type I organization at the incident. Incident Commanders coming into this area should discuss potential needs with the receiving unit and order necessary resources as soon as it can be determined if they will be needed.

## V. SUMMARY

While managing wildland fire in the Rocky Mountains may not be unique, special circumstances can arise that may differ from past experiences or present new challenges. Incident Management Teams must be prepared to accept these challenges and resolve problems associated with fire management.

Key points to note are:

- Fuel types and fire behavior- fuel characteristics unique to these areas and relationships to fire dynamics.
- Strategy/tactics - based on WFSA, WFIP, Agency Administrator direction, and management direction for particular unit.

- Special considerations - safety, management objectives, resource management considerations, functional considerations, and special technological support.

