Statement of

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Concerning

The Federal government's role in wildfire management, the impact of fires on communities, and potential improvements to be made in fire operations.

Senator Murkowski, Senator Cantwell, members of the committee, I am pleased to be able to share some of my studies and experiences in wildland fire this morning.

My background

I was born in San Diego, California into a fire family. My father served the City of San Diego Fire Department for 37 years, retiring at the rank of Battalion Chief. Our family vacations were spent camping in the Cleveland National Forest with occasional trips to the San Bernardino Mountains. The summer before I started the first grade, our campground and its surrounding area was radically changed by the 50,000 acre Conejos fire. My childhood trips to the mountains were spent watching the chaparral regrow among the skeletons of dead oaks, shrubs, and pines. In 1956, I vividly remember newspaper headlines "11 PERISH IN FIRE" proclaiming the death of 11 firefighters constructing fire line, downhill, in the Inaja Fire. This disaster spawned the "Ten Standard Fire Fighting Orders."

As a young volunteer firefighter, I knew I could put out any wild fire – "just get out of my way and let me at it." A little more experience and words of wisdom from veterans lead me to look at fire differently. Dr. Harold Biswell, a professor of forestry at UC Berkeley, introduced prescribed fire to San Diego in an era where wildfire professionals claimed that there was nowhere in California that standing vegetation could be safely burned at any time of the year. Dr. Richard Minnich at UC Riverside argued that the natural wildfire system was fuel driven, not weather driven. Spending a few harrowing minutes defending structures during the 1970 Laguna Fire gave me new respect for extreme fire behavior. These were crazy, game changing

ideas and experiences. So how did I test this new hypothesis that young fuels don't burn well, even under extreme conditions?

Since conducting a scientific experiment of fire behavior during extreme weather conditions is problematic, I searched the historic records, looking for examples of old fires constraining new ones. It didn't take very long. In October of 1967, a natural experiment in wild fire spread occurred. The Pine Hills Fire, driven by strong Santa Ana winds, burned a total of 7,000 acres west of Julian, CA. Two hours later, the Woodson Fire started in Ramona, burning 29,000 acres and numerous houses. Conditions seemed to favor the spread of the Pine Hills Fire with steep terrain, a wind corridor, and rugged roadless terrain. But by the second day, when winds subsided, the fire had stopped, on its own, mid slope, above the San Diego River. The same area had burned eleven years earlier in the Inaja Fire. The Woodson burned through the wildlands surrounding the community of Poway. Spread halted the next day when the winds stopped, some 29,000 acres and many destroyed homes later. It was apparently true that young vegetation doesn't carry fire well.

With the advent of Geographic Information Systems (GIS) and CAL FIRE's statewide data base of historical fires, I undertook a study of the impacts of old burns on fires. Fire after fire revealed the same story, the borders of a new fire coincided with the borders of a proceeding fire like pieces in a puzzle. The community of Pine Valley was spared from the devastation of the 1970 Laguna Fire by the Cove Fire of 1962. The 1956 Inaja Fire was halted by the 1950 Conejos, 2000 Pechanga by the 1989 Vail, 2003 Paradise by the 1993 Guejito, etc. More recently, in May of 2014, the Cocos Fire halted on a ridge line in the 1996 Harmony burn. There are many more examples.

Some wind driven fires burned through old burns, but not at the same rate and intensity as they consumed old vegetation. In the 2007 Witch Fire, the rate of spread in the old burn was reduced by a factor of eight from the 2003 Cedar fire. Pushed by 12 mph NE winds, the Cedar Fire traveled the 8 miles between the San Diego River at Cedar Creek and the Barona Fire Station in four hours, a speed of two (2.0) mph. Stronger 20 mph NE winds spread the Witch Fire through the same route in 33 hours – a speed of one quarter (0.25) mph. The fire was easily halted at the Barona Fire Station by a strike team of local government engines.

My experience has shown that while young vegetation does not support large fires, the opposite is true. It requires old fuel to support conflagrations. San Diego's climate is likened to a boom or bust cycle. Wet years stimulate plant growth; dry years cause dieback. Over time, dead branches are built up on and beneath the live plants. It's the dead vegetation that provides the kindling for large fires. The average age of the vegetation at the origin of fires over

10,000 acres is greater than 71 years. Large fires need to start in old fuels in order to spread with the intensity and rapidity necessary to overwhelm the fire suppression forces.

How did southern California get in the situation if finds itself today?

To understand what has happened here, we must look at the fire history of both the United States and Mexico, especially where the two nations share a common border in southern California. The United States was populated by northern and central Europeans who came from the forested parts of Europe that did not generally have the fire conditions like those experienced in the western United States. Thus the government's reaction to fires like the 1910 "Big Burn" was to institute a fire suppression system to protect the valuable lumber resource. Had the "Big Burn" been identified as a slash disposal problem, not a fire problem, I wonder if we'd have this fire problem today. Contrast this approach with that of Mexico, populated mostly by the Spanish and the indigenous Mexicans. They accepted fire as natural grazing by cattle and sheep limited fire spread in grasslands.

To this day, there is no organized fire suppression in Baja California Norte (BCA). The International border is artificial with little difference in weather, topography, rainfall, and vegetation on either side of the border. In fact there is more similarity between San Diego county and Baja California Norte than between San Diego and Ventura counties.

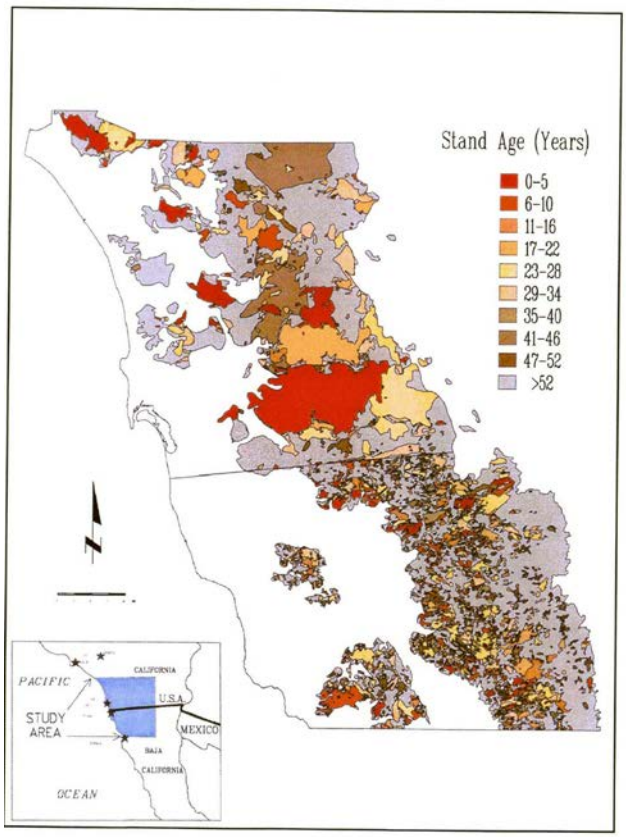

Figure 1. A comparison of fire sizes between San Diego County (upper) and Baja California (lower).

Fire suppression is generally believed to have commenced with the founding of the Forest Service in 1905, augmented in California by the Division of Forestry in 1919. It's not quite that simple. On May 31, 1793, the Spanish governor of Alta and Baja California prohibited Indian burning and instructed that all fires be suppressed. That date marks a turning point in land management plans in California. From 1793 forward, landscape fires became less frequent until 1840 when all San Diego Indians were moved to reservations and fire essentially disappeared from the dendrochronological record. Fuel accumulated until, in the early 1900's, it gradually reached "critical mass."

Dr. Minnich recognized another natural experiment, contrasting San Diego county with Baja California Norte (BCA). He painstakingly reconstructed the fire history of BCA from a series of aerial photographs. From his research, he found that the average annual acres burned are very similar on both sides of the border. The difference is in fire size. BCA is a mosaic of small fires up to ca.7500 acres, primarily burning in summertime moderate conditions. Most of the acreage in San Diego is consumed in a few large fires of up to 280,000 acres burning under extreme (Santa Ana wind) conditions. The unintended consequence of aggressive and effective fire suppression is a shift from moderate intensity summertime fires to wind driven conflagrations.

> "Examination of the fire history SCA [southern California] and BCA leads to several fundamental conclusions vital to fire management. Most important, fire poses a cyclical threat in space and time. The removal of fuels by fire precludes a recurrence for decades." Minnich. 2001

Large fires burned 50-60,000 acres in the first half of the 20th century. But in 1970, things seemed to change. The Laguna and Boulder fires together burned 190,000 acres and destroyed 382 structures. Other southern California counties experienced large fires that burned statewide ca.80,000 acres, destroyed 722 homes and killed 16 people. Out of this disaster came the Incident Command System, adopted by all southern California fire agencies as a common incident management system.

190,000 acres was an outlier, or was it? The new century brought 2003 Cedar and Paradise Fires with 16 fatalities, 330,000 acres, 2500 structures; statewide 22 fatalities, ca.750,000 acres, and over 4000 structures destroyed. Four years later, the Witch, Harris, Poomacha, and Rice Fires killed 7 people, burned ca.350,000 acres and destroyed ca.1,800 structures. Statewide in the 2007 fires 10 died, ca.500,000 acres burned, and ca.3210 structures were destroyed.

There is a saying that "as California goes, so goes the nation." This is certainly the wrong place for California to be the leader. Old timers predicted that the forests would follow the chaparral fire regime with large explosive fires. The 2013 Rim Fire, the 2014 King Fire, and the 2008 lightning series in northern California seem to prove them right.

Nationwide, fires are larger and more costly, although ignitions have decreased. Acres burned nationally for the ten year period 2005-2014 have doubled over the period 1975-1984, thirty years earlier. The number of fires has DECREASED by a factor of 2. Ignitions are random and ubiquitous. There are more than enough fire starts to maintain the present fire regime.

The metric that some percent of the fires are stopped at less than some acreage is irrelevant. It's the initial attack escapes that matter.

In spite of our best intentions, the law of unintended consequences proclaims that we are, in actuality, managing for stand replacement fires. It's the old fuel and the overstocked vegetation that causes the large fire problem, not the initial heat source.

Funding Fires and Reducing Costs

Many have looked at the rising cost of fire suppression and proposed ideas to reduce cost or limit the rate of increase. Certainly the air program is the most expensive part of wildfire operations. Unfortunately, it has becomes a metric in the minds of many to measure the cost of any other expenditure on the fire ground. "Well, my request costs less than a single air tanker drop [so it's inconsequential]."

Part of the increase is required by changes in governmental regulations, such as limits in work hours per day, the shift to bottled water, disposal of gray water, and environmental restrictions on the use of retardants and mechanized equipment.

Other costs include improved fire camp computer systems, scores of air conditioned office trailers and briefing tents, reluctance on the part of the home unit to release the team until no source of heat remains on the fire, unscrupulous contractors that game the system, inability to obtain necessary resources in a timely manner and reluctance to release them when the need is reduced, invasive plant concerns requiring expensive "weed washers" whose effectiveness is questionable, and additional positions required on IMTs such as Human Resources Officers and Liaison Officers that could be added to the incident only if needed.

Local government resources are expensive because most work a 24 hour schedule which requires their parent agencies to be reimbursed on a 24 hour basis. The mitigating factor is that local government firefighters are being trained in large wildland fire operations which increase their value on local, state, and federal fires. One cost saving approach on large incidents has local government resources report to the incident just before the peak burning period begins and releases them each evening after the structure threat has passed. Another option is to release local resources while retaining more distant units. The local units can be recalled as surge force if conditions warrant.

The federal agencies do not have the numbers of willing and available personnel to staff these fires. Traveling great distances for 14 days away from home (which is almost always 16 days due to travel days) is difficult for an employee in a family where both parents work. Society has changed; mom works too. Or mom works for the fire agency. Or both parents work for a fire agency.

So the only practical method of reducing costs is to incentivize the teams in that direction. Presently, the incentive is to put the fire out with the least impact on the local community and the resource. Answering the question, "Why didn't you have enough engines or helicopters or air tankers to save my house?" is the prime motivation for ordering resources. Cost is secondary. Every division needs more engines and crews. Every section could use more help.

Rewards for saving money could be more assignments, national recognition, citations in personnel files, and support from forests and other units toward cost savings. Developing metrics that compare team performance against a computer model of incident complexity and risk would keep cost saving in the minds of the teams.

Local and state governments are eligible for a 75% cost share from FEMA for major fires. "The Fire Management Assistance Grant Program (FMAG) provides a 75 percent Federal cost share and the State [tribe or local government] pays the remaining 25 percent for actual cost." (FEMA) This could serve as model for a similar program on federal lands.

Air asset costs are discussed later in this statement.

What for the Future?

Yogi Berra said, "Predicting is difficult, especially if it's about the future." However, we know we have a fuels problem. We are presently treating about 2 % of our 190 million acres in need. (Wildfire Management: Federal Funding and Related Statistics. February 4, 2015. Congressional Research Service) (http://www.fs.fed.us/publications/policy-analysis/fire-and-fuels-position-paper.pdf)
This represents a 50 year rotation cycle in forests, many with 10-20 year natural fire intervals, and it is likely occurring in the areas which are less complex to implement. In the next 50 years we are warned to expect significant increases in temperature with potential decreases in precipitation and precipitation patterns. So it is apparent that we are not even treading water.

Are we abandoning our wilderness and roadless areas and old growth forests to stand replacement fires?

Hazardous fuels reduction. Millions of acres of fire dependent forests and other lands are multiple fire cycles from their natural fire interval. In some parts of the country such as the southwest, climate change may be severe enough to threaten entire forests with massive tree die off due to drought. We should be looking at climate models to determine how many trees per acre can survive in the new climate. Some can benefit from prescribed fire but most will require mechanical thinning before the application of fire. We need to select areas that are accessible to mechanical equipment so that forest can be treated economically. If the forest products removed by thinning have value, those proceeds of sales should be used to offset the cost of thinning. Trees to be removed must be selected by a multi-discipline team of experts

considering fire behavior, tree health, diversity, randomness, etc. Well-meaning environmental groups force compromises upon agencies that result in projects that make no natural or environmental sense. There are forests today that look like the power pole national forest – all old large trees evenly spaced.

Not all forests require mechanical treatment. High elevation forests such as those in Yosemite National Park can be treated by allowing naturally ignited fires to burn. They must be allowed to continue every year because they presently are not meeting their acreage objectives. Some areas burned in earlier fires need fire again. Blanket national policies requiring all fires to be suppressed are reminiscent of the policies that got us where we are today. The success of the prescribed fire program in Yosemite was shown in the 2013 Rim Fire by the lack of tree damage in treated stands.

NEPA

The National Environmental Policy Act (NEPA) requires the federal land management agencies to consider that all environmental factors are weighed equally when compared to other factors in the decision-making process to perform some action on federal land. It has become a weapon in the hands of the few to block anything, or at least delay projects. It diverts dollars from fuels reduction to staff preparing and revising an Environmental Impact Statements (EIS). For example, the San Bernardino National Forest proposed a watershed wide EIS for the 21,000 acre Santa Ana watershed.

> NOI in Federal Register 11/06/2012 **Description:** Fuels reduction within a 21,000-acre analysis area to reduce the risk of high intensity wildfire to adjacent communities, organizational camps, and recreation residences. Occurs within Sugarloaf IRA DATES: Comments concerning the scope of the analysis must be received by December 6, 2012. The draft environmental impact statement is expected July 2013 and the final environmental impact statement is expected September 2013.

The revised date for the draft EIS is June of 2015 with the final expected January of 2016. Over three years to undertake an action that is prudent and necessary for ecosystem health and the protection of life and property is a misapplication of the intent of the law.

NEPA has other unintended effects. A large interagency prescribed burn on Cleveland National Forest and Cuyamaca State park was conducted in the spring of 2003. Due to the complexities of getting an EIS for riparian areas, those portions were excluded from burning. When the 2003 Cedar Fire contacted the prescribe burn area, it halted. However, the untreated riparian areas acted as wicks and carried the wild fire through the project and into the untreated areas outside.

These objections to action are frequently by those that want the forest left natural. But that option has been co-opted by decades of fire suppression. To do nothing is not the option because to do nothing is to doom the forest to a stand replacement fire. There must be a way to simplify the process without jeopardizing the environment. There are hundreds of dedicated federal employees who are doing their utmost to manage our public lands in accordance with sound scientifically based practices. They appreciate the support they received from Washington.

Strategically Placed Landscape Treatments (SPLATS) methodology should be used to select areas for treatment.

> SPLATS are blocks of fuel treatments ranging from several to hundreds of acres each, placed in a way that controls the speed and intensity of fire as it moves. The pattern of placement is determined through fireshed assessments and designed to eliminate continuous pathways of untreated fuel that fire might use to race from the bottom of slopes to ridge tops. The goals are to keep fire on the ground, slow it down, and reduce its intensity so it can be modified across large landscapes. (http://www.fi rescience.gov/projects/04-2-1-84/project/04-2-1-84_final_report.pdf)

SPLATS site criteria should also be based on access by mechanical equipment, natural fire breaks, and the projected climate change effects.

Previous Stand Replacement Burns.

A new issue will be forthcoming with fuels. Forests that have had stand replacement fires will have snags and logs for 20 plus years. Shrubs that follow these large destructive fires are resistant to fire while they are young. But the areas may burn again like occurred in the Rim fire, contributing to the fire intensity and corresponding plume dominated fire behavior. Predicated climate changes will intensify this phenomenon.

The present drought may be cyclical or it may be climate change related. In either event, this is a critical issue that calls for national leadership reminiscent of the early days of the space program. We can hope that the climate molds are wrong, but “hope is not a plan.”

Technology

The wildland fire forces are woefully behind in technology. Spanish fire fighters have had GPS location transmitters by law for over seven years. Our management teams have taken charge of fire that does not have an accurate map of the fire’s location. The internet is replete with programs and apps related to fire. But many, if not most, wildland fires don’t have internet access. Fire spread models take longer to run than some fires spread. Behave, the fire behavior calculator program, is not available on a smart phone. Many innovations have come from team

members, not their parent agencies. And some innovations such as crew members carrying smart phones, pictures posted on social media, etc. are resisted by management.

GPS units placed on individuals or units would probably be desirable. But these are not a panacea. They have batteries, they fail, they get lost, etc. They must use satellites or a combination of satellites and the internet for coverage purposes. That doesn't mean that because they are not perfect, they are not good. Do we assign someone ($$) to watch the screen 24/7? Do we just go look if we sense a need? Do we build a geo-fence around them that alerts if they change position beyond predetermined point or line? And knowing where they are when they call for help does not necessarily mean rescue. Aircraft must see the ground and be close enough to the ground to make effective drops. Drops from high altitudes reach the ground over a wide area as a light mist, not enough concentrated enough to impact an intense fire. Drops prior to the fires arrival and more importantly the smokes arrival could be effective.

There exists today a device capable of creating an ortho-rectified map of a fire, detailing fire line, intensity, and spot fires and posting that map on the internet. The aircraft flies above the fire and above the Temporary Flight Restriction (TFR) imposed around wildfires where aircraft are operating. Estimated cost is $250,000 each. (Airplane and crew extra) I used maps from this system on a fire in 2007. Without a near real-time map of the fire line and spread direction, equipping crew with GPS transmitters for safety reasons is somewhat limited.

Incident Management Networks and Software

The Incident Base needs to be computerized. Much has been done towards this goal but it seems to be lagging the technology. One of the easiest ways to reduce costs would be to automate the release of resources. 20 person crews or 5 person engines can be held over for 24 hours due to inefficiencies in the demobilization process. The system should be tested on simulated incidents, not beta tested on going wildfires.

Air Assets

Air tankers are effective on initial attack fires, yet there seems a hesitancy to use them until ground units arrive on scene and make a request. A system should be designed to consider weather and fuels data, time of day, etc. that suggests to dispatchers that an air tanker or helicopter should be sent.

Pretreating areas in advance of the fire is questionable at best. Effectiveness of these tactics should be scientifically examined and policy developed for their use.

Heavy helitankers may be more effective than air tankers if adequate water is available in a short turnaround time.

When structures are actually threatened, the public will demand that the air assets fly, effective or not. During the 2007 fires in San Diego County, Navy and Marine Corps helicopters were pressed into service. It is credit to the professionalism of the pilots and the interagency team of air operations staff that this was done safely. To my knowledge, no study was conducted to determine the effectiveness of this action. The public was mollified.

When structures are not directly threatened and air tankers are ineffective, they should be held ready for new starts. This is the biggest opportunity to save dollars but it will take clear, unambiguous policy directive to make this happen. For example, there are always structures "threatened," no matter what the real threat may be. A definition of threatened, both quantitative and qualitative is needed. Here is where an accurate near real time map of the fire and a fast, laptop, fire spread model would provide an objective assessment of structures at risk and the role air assets could play in protecting them. It is important to note that air tankers and heavy helicopters must be able to see the targets in order to safely fly. Where fire is spread is highest, where structures are at most risk, and where crews are at most risk, the air tankers cannot operate.

Helicopters are being used for mop up at risk to pilots and ground crews greater than the benefit. They are a very expensive, risky, and an inefficient way to deliver water.

Wildland Urban Interface/Intermix (WUI)

Wildland-urban interface are lands within and adjacent to (usually within ½ mile from) communities that abut or are surrounded by wildlands potentially subject to wildfires. Homes are being constructed out of cities adjacent to the wildlands and inside of the wildlands. Decades of fire suppression have left forests vulnerable to catastrophic fire. The changes in forests have happened slowly, imperceptible to most humans. The over-stocked, dense forests of today are seen as normal.

Fire Safe Councils

Fire safe councils are grassroots community-based organizations which share the objective of making California's communities less vulnerable to catastrophic wildfire. Firewise communities develop an action plan that guides their residential risk reduction activities, while engaging and encouraging their neighbors to become active participants in building a safer place to live. Formal recognition as a Firewise Community is obtained from the National Fire Protection Association. These communities have had successful outcomes during wildfires. However they

seem to proliferate after a major fire but as the fire fades from memory, so do the organizations. The large fire return interval in a community is probably greater than 50 years. The challenge is to find those communities at risk today and gear up the existing organizations for the long haul.

Community Wildfire Protection Plans (CWPP) have shown to be successful in small communities and subdivisions of larger ones. Homeowners prepare the plan, organize community "chipping days," and help each other maintain defensible space in their communities. Larger cities have hired consultants to do the work which misses the point. These need to be grass roots operations. The residents must complete the plan, with guidance from agencies, because, as General Eisenhower said, "Plans are nothing, planning is everything." San Diego has many CWPPs as result of the fires of 2003 and 2007.

Building Codes

San Diego has had the strictest building codes in the state since 2003. Homes built under these codes fared better than other houses in the 2007 fires. However, it is not possible to distinguish structure saves due to building construction from save due to vegetation clearance incidental to the home building process. Homes become lived in, housekeeping is an issue, embers will set fire to anything flammable, vegetation must be free of dead wood and flammable litter, mulch will carry fire etc. Building codes are extremely variable state by state, county by county, city by city. A grant criterion tying eligibility or amounts to building codes may have merit. We can't just keep requiring more and more stringent building codes followed by running big fires at the houses to see how they do.

Defensible Space

One size can't fit all. Buildings catch fire from radiant heat, convective heat, and embers. And like building a campfire, kindling is a necessary component. With the proliferation of smart phones, the agencies should build an application that would gather all the pertinent data for a given structure and determine the optimum treatment needed to make the property defendable.

Defensible space implies that someone or something will be there defending the improvements. There will never be enough large fire engines with 3 to 5 trained fire fighters to defend all the houses threatened in major fires. The public has been taught to evacuate at the first hint of danger and expects government to protect the property. The perennial argument between wildland agencies and local government is that structure fire protection is the responsibility of local government vs. the structures are threatened because of the wildland fire. Let's agree that both groups have a point and work together.

- We need to train able-bodied homeowners to stay with their houses IF their houses are defensible.
- Establish a program, perhaps with FEMA, to partially fund the acquisition of slip on units for local and state government designated vehicles to be stored and maintained until periods of extreme fire danger or active fires. Vehicle would be staffed by a trained agency driver and a trained fire fighter, volunteer or off duty paid. These would be organized into task forces under the direction of a qualifier task force leader and used to follow the fire front and prevent homes from igniting.
- Increase training in structure protection and wildland operations for local government forces.
- Cost share fuels treatment within 500 feet (?) of development and minimize the permitting burden for residents to conduct fuel modification on federal land (firewood gathering?)

Summary

- Double (at least) the number of acres treated under the Hazardous Fuels Program.
- Revisit criteria for selecting areas for treatment including cost per acre, forest health, climate impacts, and risk of stand replacement fire.
- Modify NEPA to simplify and expedite the process for forest fuel management actions.
- Incentivize teams for reducing costs while insulating them from criticism caused by the perception of not having enough resources.
- Adopt a program similar to FMAG for federal wildfire disasters.
- Develop metrics and computer models for appropriate and effective use of air assets while minimizing risks to aircrew and ground personnel.
- Train and partially equip state and local government personnel in post fire front structure protection tactics.
- Equip each unit (Engine officer, Squad boss, Dozer, etc.) with satellite GPS locating devices and each supervisor with satellite based display devices for each unit under their command.

- Adopt existing Forest Service Research FireMapper system and install on at least one aircraft per region.
- Adopt real time fire modeling software to allow field commanders to make decisions based on science based projections of fire spread.