(International)
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Funding For Aerial Operations

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ABOUT WILDFIRE RESEARCH NETWORK

Wildfire Research Network is a 501 c (3) non-profit, public safety, research and education organization, created to improve wildfire suppression capability throughout the United States.

The objectives of the organization are:

- Research phenomena and promote improved methods to control wildfires.
- Provide information and recommendations to the public, private enterprise and all levels of government.
- Explore innovative **partnerships** and financial strategies to accelerate improvements.
- Facilitate establishment of a national wildfire research institute to bring final resolution to the nation's wildfire control issues.

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FUNDING FOR AERIAL OPERATIONS

PREFACE

Wildfire Research Network.(WRN) is a Los Angeles based non-profit research organization established eight years ago to improve wildfire suppression capability throughout California and the United States.

A copy of this presentation is on the WRN website (www.wildfireresearch.org) to make it generally available to the wildfire fighting community.

INTRODUCTION

Whatever wildfire control strategies we wish to pursue… consideration of the amount of money required and where it is going to come from is a central issue…. Thus funding is a vital topic for us all.

In this presentation we comment on conditions in the United States… but much of what we say will also apply to many other areas around the world.

TRENDS

We want to begin by reviewing trends evident in the wildfire control environment that will likely influence future funding.

FIRST…There have been increasing acres burned and numbers of homes and other structures lost due to wildfires over the last few decades in the U.S. At least 7 states have had the worst wildfires in their history in the last 6 years.

FIGURE 1, for example, shows the structures, mostly homes, lost to wildfires over the last few decades in California where most of the country's losses have occurred. Trends such as these are ominous if they are allowed to continue!

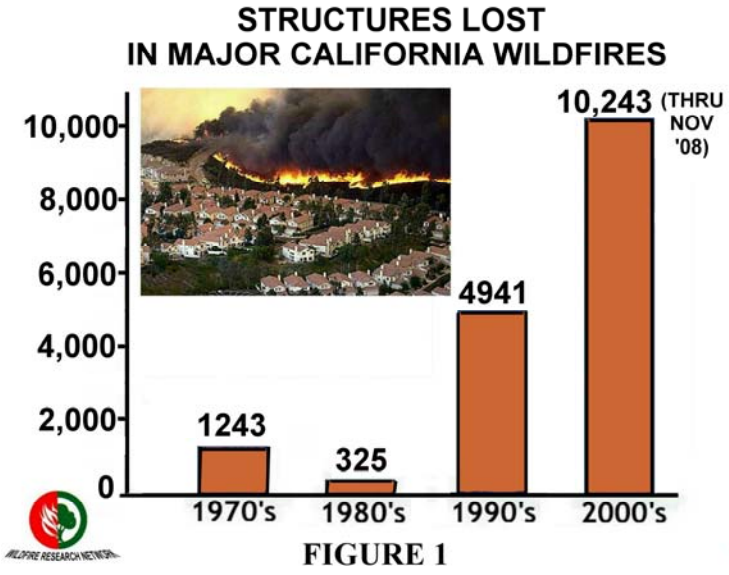

FIGURE 1

FIGURE 2 illustrates what many believe are the major causes for the upward trend in losses…

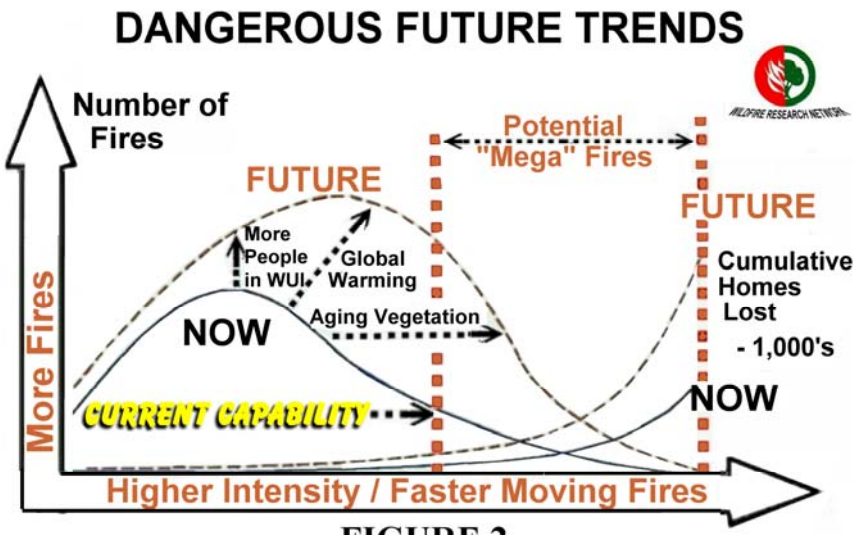

FIGURE 2

In the past, the majority of the brush fires occurred in conditions of fairly moderate vegetation, weather and remoteness from inhabited areas. Available fire suppression forces could contain the fires before significant cultural damage occurred. Occasionally, strong windy/warm weather conspired with aged, dry stands of vegetation with ignitions occurring near inhabited areas such that significant losses in homes and other cultural and forest resources occurred before suppression or weather relaxation could bring about containment.

In the future, because of global warming,… more people moving into Wildland Urban Interface (WUI) areas…and general aging of vegetation due to prior forest fire suppression policies, more fires are expected and they will be the higher intensity/faster moving fires that current suppression forces have difficulty containing. The large runaway fires have been called "Mega" fires because of the suppression costs incurred and the damage they cause. Without significant improvement in current capabilities…the "Mega" fire numbers, costs of containment and cultural losses are expected to continue their upward trend.! …

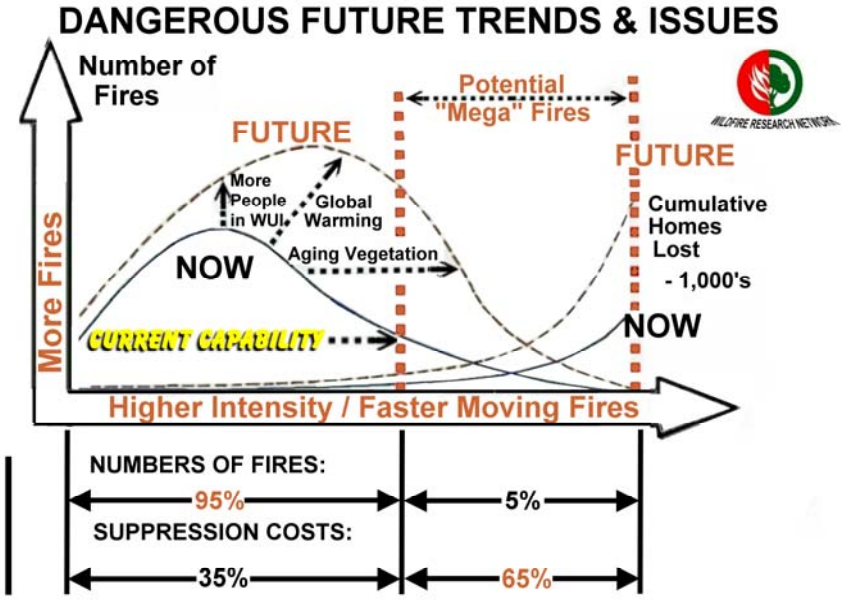

FIGURE 3

FIGURE 3. Typically, fire agencies have been able to quickly extinguish approximately **95%** of the wildfires, but the small remaining percentage that escape initial attack are causing virtually all the destruction. This small percentage of fires are responsible for **65%** or more of total annual suppression costs!

If costs are to be contained, something must be done about the small percentage of fires that are currently escaping initial attack.

FUNDING CATEGORIES

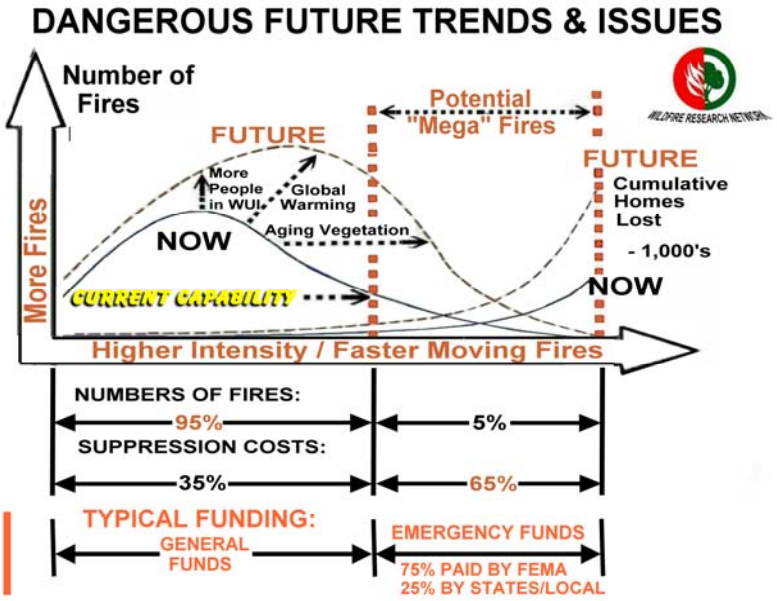

FIGURE 4

FIGURE 4. In the U.S., wildfire funding is typically of two types:

(1)General Funds - cover normal expected annual expense.

(2)Emergency Funds – special authorizations to cover above normal expenditures. Emergency Funds basically cover only the additional operating expenses to suppress large fires that escape initial attack and require significantly more lengthy and expanded operations,… more suppressants and include the costs of outside agency support brought in via mutual aid agreements.

(3)The Federal Government through the Federal Emergency Management Agency **(FEMA)** typically pays **75%** of the expense of fires declared a national emergency by the president. The fires must be declared state emergencies before there is national action. In most cases the costs are apportioned 75% to the Federal government, 20% to the states involved and 5% to local governments.

Notably, however, virtually none of the fire agency funding available in the U.S. provides for any Research and Development (R&D) to provide more effective equipment to address the potential larger faster moving fires.

Historically, new types of equipment have been developed by private commercial ventures and offered to the fire agencies. Because of the high cost and risk of such developments, without prior assurance of a return on the investment, such R&D has fallen behind current needs. **This is a funding area that needs more attention and support in the United States**.

The U.S. military and space programs have very vibrant Research and Development departments constantly aimed at improving their operational performance. The wildfire fighting services need this type of support at this time.

AVIATION SUPPORT COST (i.e., EFFECT ON NET FUNDING REQUIRE MENTS)

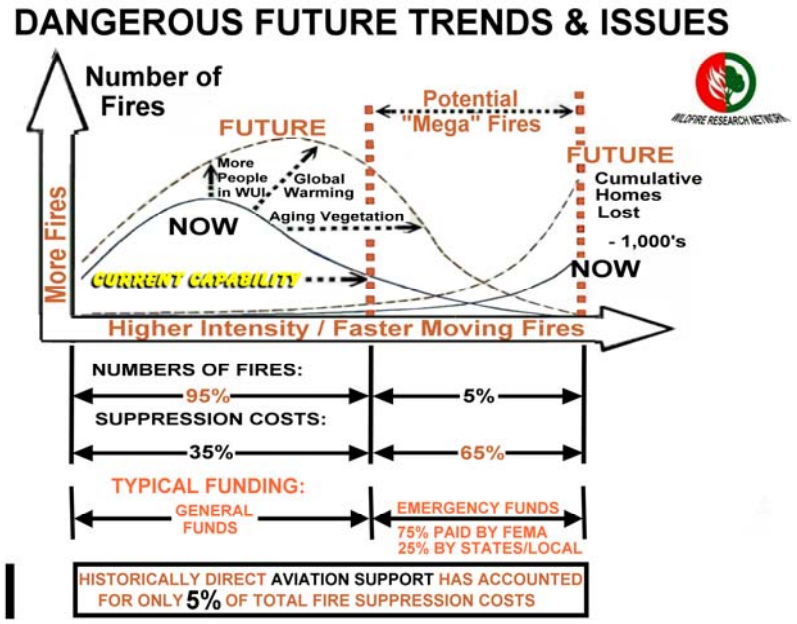

FIGURE 5

FIGURE 5. A significant historical observation in the U.S., is that while individual aviation capitalization unit costs and hourly operational costs are significantly higher than any of the ground firefighting equipments or hourly operating costs, …when large fire incident costs are summed up,… aviation costs have historically only been about **5%!** This is because aviation support is not needed, or only slightly needed for the **95%** of the fires that are comfortably handled during initial attack.

While aviation assets are more highly needed as fires increase in intensity and rate of spread, they often must be temporarily sidelined during these conditions because of operational limitations like wind speed and non-operability at night!

With the trend to more higher intensity, faster moving fires, aviation utilization and its proportion of total suppression costs are moving up but still are not a major net suppression cost factor. This means that if additional aviation asset acquisition and operation is desirable, the effect on relative proportion of total cost should not be dramatic. However, the more significant impact of effective aviation support will likely be a REDUCTION in the TOTAL cumulative suppression costs and cultural losses. Their use helps STOP the fires sooner in clock time and reduce the ground area(size) that fires ultimately reach.

Aviation's contribution to reduced total suppression costs and cultural losses affects both General and Emergency funding requirements – but have a much greater reduction effect on the larger Emergency Funding requirements.

GROWING INTEREST IN LARGE CAPACITY AIRTANKERS

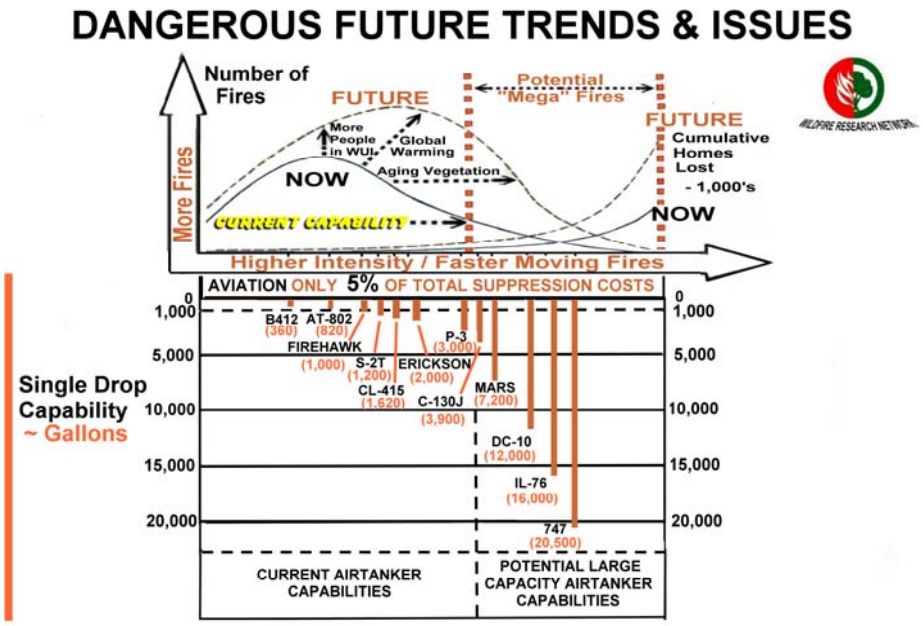

FIGURE 6

FIGURE 6. The trend to increases in the number of potentially larger faster moving fires has produced interest in larger capacity air tankers…These fires require more suppressant and retardant applied per unit of time for effective suppression. Thus, bigger is proving to be better as initial operations of the 12,000 gallon DC-10 and 7200 gallon Martin Mars have recently demonstrated in California and Washington states in the U.S. over the last two years.

Expanded use of large capacity air tankers means operating agencies must face the reality of larger unit standby and flight hour costs to savor lower overall suppression costs and cultural losses.

GETTING BIGGER ALONE HOWEVER IS NOT A PANACEA

While having larger capacity air tankers will help in many Mega fire situations—added capacity **alone** will not stop all Mega fires. Currently the U.S. large fixed-wing air tankers do not operate at night and usually suspend operations when wind speed exceeds 35 mph!

The Cedar Fire, the most destructive fire in the U.S. in 2003, started at dusk, burned for 12 hours before fixed wing air tankers could be employed. Almost half of the larger fires in the 2007 Southern California firestorm started between dusk and dawn!

Military air operations are not suspended at night or during high winds. Something must be done via Research and Development to bring military technologies into the wildfire fighting aerial fleet.

FIGURE 7. Third generation night vision goggles (NVG) are being used in the U.S. military, commercial helicopter operations and in three local California wildfire fighting helicopter operations.

This capability has not yet been put into operation at the state or national levels. Lack of funding is a major obstacle, though actual costs are very modest (less than 2% of cost of a helicopter). Adding NVG can provide almost 100% increase and availability to fight fires for each unit now in service.

FIGURE 7

FIGURE 8. There is private development work being done in California for a Precision Container Air Delivery System (PCADS) that has potential promise for maintaining the effectiveness of air drops under high wind conditions….

FIGURE 8

FIGURE 9. This activity has recently caught the attention of the U.S. military and an initial exploratory contract for $2.3 million dollars has been awarded to pursue the concept. [The contractors (Flexible Alternatives and Boeing) had a booth at the conference.]

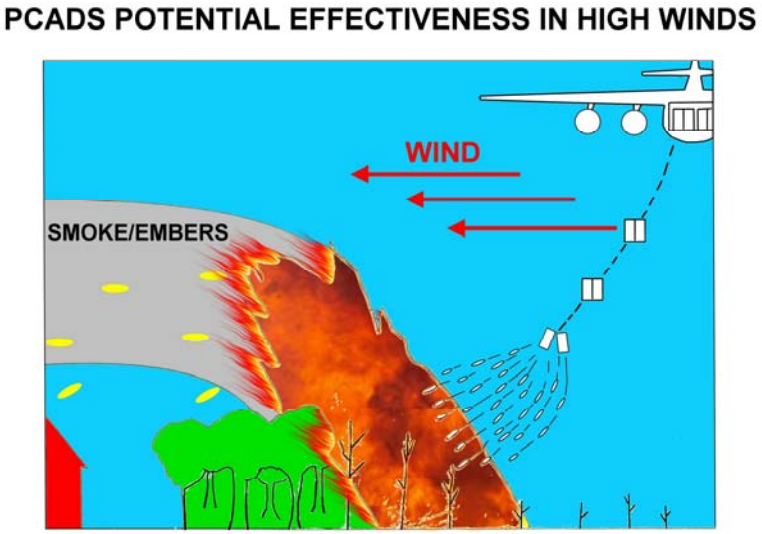

FIGURE 9

In the U.S. there is no fire agency charged with the responsibility, and given the funding and authority to do effective Research and Development to identify solutions to the fundamental technical problems currently preventing early extinguishments of potentially big/destructive fires. **This is a funding void that should be given more attention in the United States.**

BUDGET TRENDS

FIGURE 10. Wildfire fighting budgets have been steadily rising . This chart, FIGURE 10, is an example of the historical Federal agency budgets**.**

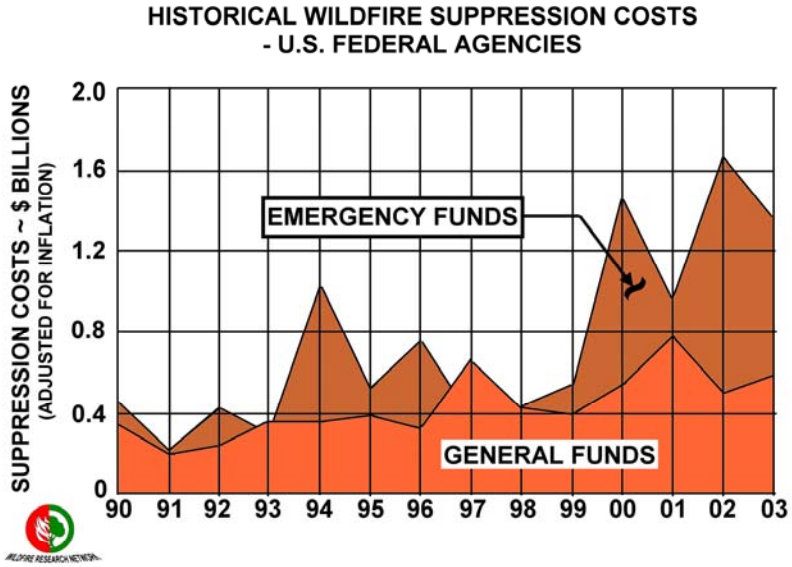

FIGURE 10

FIGURE 11 has similar information for the state of California's firefighting agency CAL FIRE.

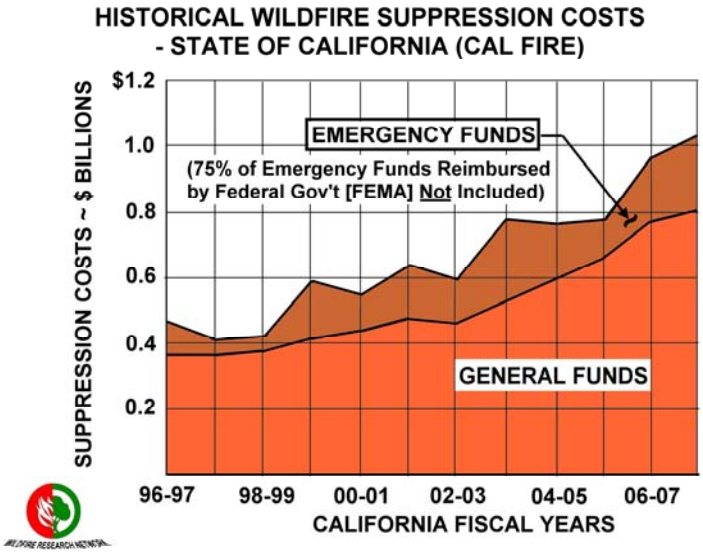

FIGURE 11

FIGURE 12 compares Federal, State and Local firefighting agency budget growth to a national inflation index (The Consumer Price Index) and the population growth figures for a common time period.

FIREFIGHTING BUDGET TRENDS VERSUS INFLATION AND POPULATION GROWTH

Changes From 1998-2008

INDICATORS	National Inflation (CPI)*	+33%
	U.S. Population	+8.5%
	California Population	+12%
BUDGETS	Federal Wildfire Expenditures	+360%
	California (CAL FIRE) Expenditures	+222%
	Los Angeles County FD Expenditures	+192%
	Los Angeles City FD Expenditures	+170%

* Consumer Price Index

FIGURE 12

Obviously the cost of firefighting is rising much faster than can be explained by the combination of inflation and population growth. WRN believes this is due to the increasing number of Mega fires.

FUNDING COMPETITION CONSIDERATIONS

Today, in the U.S., there is intense competition for the money available for necessary and highly desirable public services like firefighting on the local, state and national levels. In this environment,

funding for wildfire fighting improvements is below the level required to timely field needed improvements.

WRN believes this situation is partly due to a neglected and underdeveloped analysis of the true **total** cultural losses the public is suffering that accrue from wildfires.

FIGURE 13 schematically illustrates what preliminary analyses and professional perceptions conclude is the trend progressing in the United States. Missing are the actual verifiable cumulative cultural costs in actual dollars….

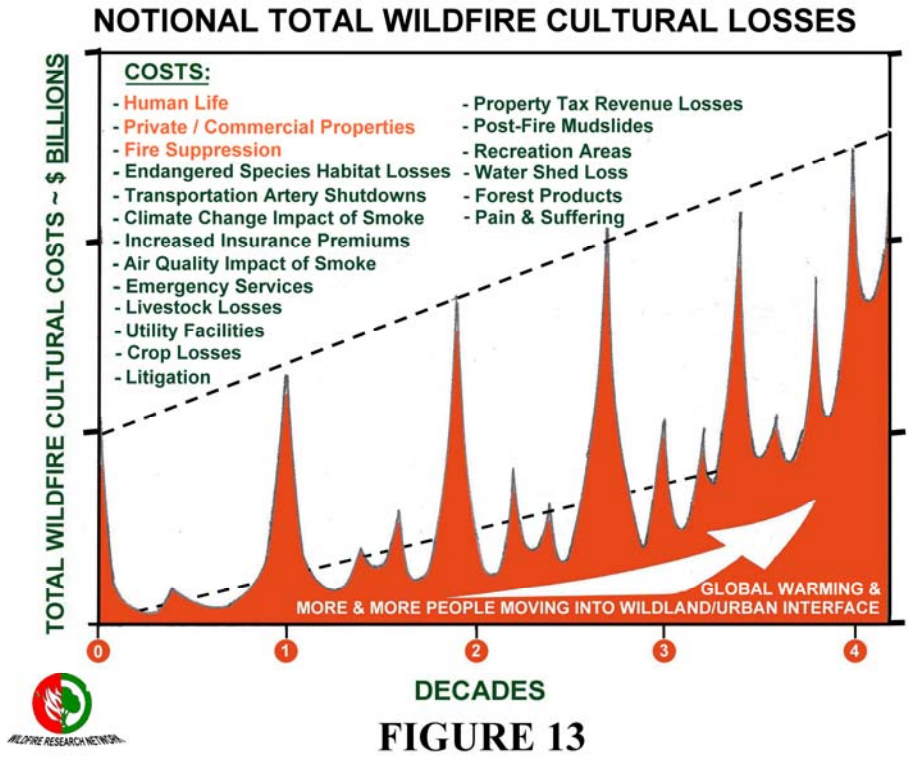

FIGURE 13

Most cultural cost assessments of wildfires only report the top three (human life, property loss and suppression costs).

The other cultural losses listed in the figure are typically posted with non-fire department government agencies or private/commercial/public entities and never collected, summed and reported as a direct result of the wildfires! Limited preliminary studies conducted by fire professionals and university investigations of specific fires has led to the speculation that that the typical formally recorded cultural losses due to wildfires account for only about **50%** of the actual accumulated cultural dollar losses!

The Chart indicates that in the distant past, very large (Mega) wildfires were a rare occurrence: approximately one per decade or longer with very long periods of much lower losses in between. The trend to more frequent mega fires has been advancing steadily until now the U.S. is experiencing them with only 2 or 3 years in between! Recorded cultural costs of **individual** mega fires have also dramatically increased.

These increases are believed due to global warming, more people moving into the Wildland Urban Interface (WUI) areas and the former aggressive national wildfire suppression policy that led to unnatural ageing of the average wildland vegetation.

WRN believes that,… if the true cumulative cultural costs of wildfires were rigorously compiled and tracked, wildfire control funding would fare much better than current experience. Significant cumulative cultural costs reductions could be shown for the relatively modest increased General Fund investment costs needed to field more effective equipment. The huge Emergency Fund expenses of mega fires would be reduced.

CREATING A WILDFIRE FUNDING CHAMPION

FIGURE 14. In the U.S., wildfire fighting is accomplished by a combination of basically autonomous local, state and federal agencies that report only to their respective governing bodies. The seven federal sub-agencies report to Cabinet level offices that are not primarily concerned with wildfires!

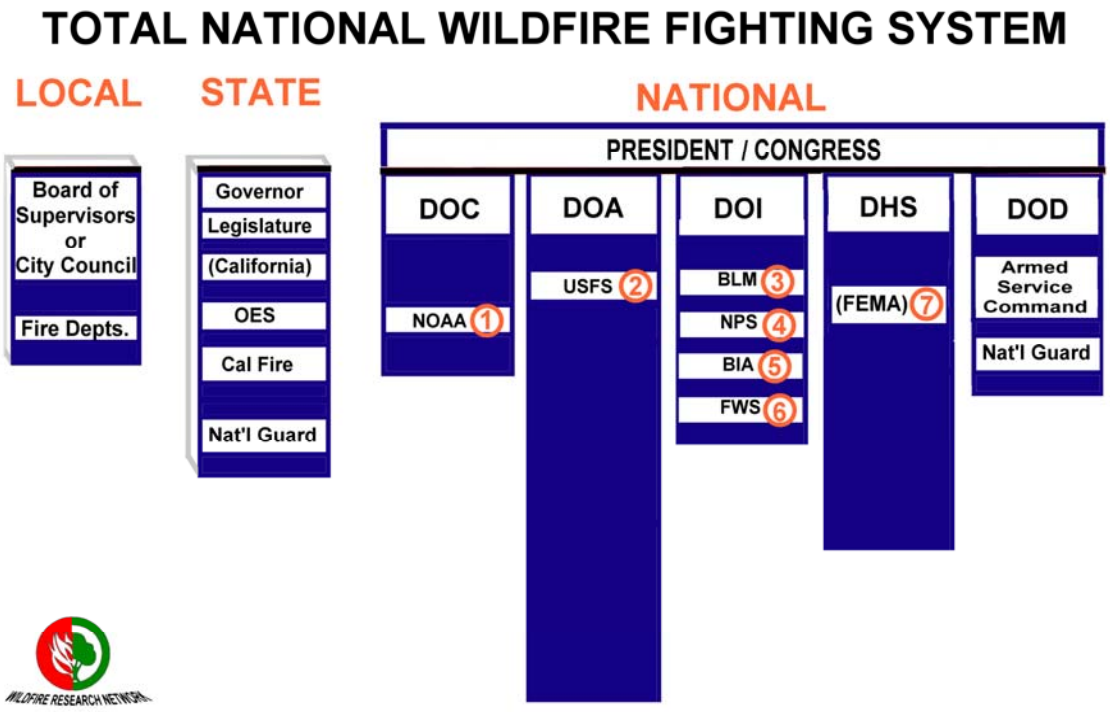

FIGURE 14

Coordination is accomplished primarily at individual incidents using a generally accepted Incident Command System(ICS) for large fires and Mutual Aid Agreements. These arrangements are augmented by a few standing and(ad hoc) temporary committees.

There is no overall wildfire fighting agency that receives regular reporting of operations from the whole system that can then do the meta analyses required and direct investment funding to evolve coordinated workable solutions to the system's fundamental problems.

Currently there is a strong competitive environment for all government funding. There is no single strong voice high enough in U.S. government to present the wildfire system's case adequately in the national forum to obtain the needed funding.

Obtaining adequate funding for aerial wildfire fighting is a challenge that must be engaged with persistence and spirited creative thinking.

SUMMARY

FIGURE 15. Wildfire fighting budgets and cultural losses are going up because there are increasing numbers of Mega fires that our current system cannot handle well. Until we develop equipment systems that can stop Mega fires,… costs for suppression and cultural losses will continue to escalate!

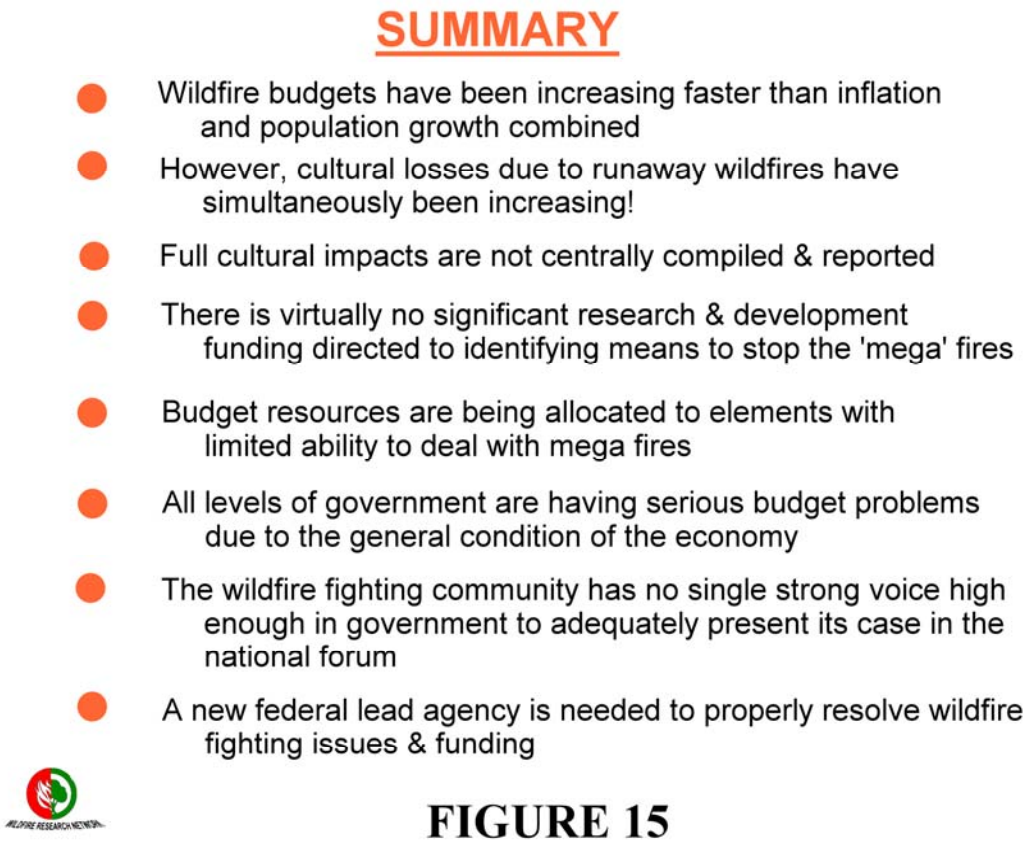

FIGURE 15

Proper funding relates not just to the amount of money – but involves spending on the right things.

More money must be spent in Research and Development to identify needed new capabilities.

The current system of autonomous local, state and seven Federal sub-agencies do not have the span of control, resources, or in-house technical expertise to orchestrate solutions to the fundamental Mega fire technical challenges.

A new Federal…lead agency is needed to properly resolve U.S. wildfire fighting issues.

TONY MORRIS - RESUME
AERIAL FIREFIGHTING CONFERENCE
ANAHEIM , CA FEBRUARY 19 & 20, 2009

After nearly losing his home in the 1993 Topanga/Malibu wildfire in California, Tony Morris became involved in researching wildfires and firefighting aircraft. In 2004, Mr. Morris was a founder of Wildfire Research Network(WRN), a non-profit public safety research foundation concerned with improving wildfire fighting capability. In 2004 Mr. Morris supported WRN's testimony at the California Governor's Blue Ribbon Fire Commission established to find ways to avoid a repeat of the 2003 wildfire siege in Southern California.

In March 2007, Mr. Morris testified for WRN before the California State Assembly Resources Committee in support of state funding for Tanker 910, a 12,000 gallon capacity firefighting aircraft. In December 2007, Mr. Morris also testified at a Field Hearing of the U.S. Congress Subcommittee on Domestic Policy in Fallbrook, California. The subcommittee convened to hear testimony regarding the readiness of local, county, state and federal fire agencies during the 2007 Southern California wildfire siege.

Mr. Morris is a Contributing Editor for VERTICAL and VERTICAL 911 magazines. As a freelance writer, he has authored more than 20 articles on rotary and fixed wing aircraft. Mr. Morris is a frequent observer at the Los Angeles County Fire Department Air Operations.

Mr. Morris was a writer/producer with the MONTAGE Documentary Unit of NBC-TV and has been involved in the production of over 40 documentary films. He was a Project Manager for Kajima International Construction, responsible for managing the construction of a number of large-scale commercial projects in Southern California. Mr. Morris is a graduate of Yale University, attended the USC Masters in Cinema Program, and has a Master's in Architecture from the Southern California Institute of Architecture.

CAREER HISTORY
ROBERT L. CAVAGE, WILDFIRE RESEARCH NETWORK

Mr. Cavage is a retired aeronautical systems engineer with over 38 years of professional experience with major aerospace firms.

His career began with graduation from Pennsylvania State University with an Aeronautical Engineering degree. His first four years were with General Dynamics-Convair in San Diego where he learned the practical basics of applied aerodynamics, wind tunnel operations, aircraft performance characterization and preliminary design. Aircraft types included supersonic interceptors, subsonic transports, seaplanes and several short and vertical takeoff and landing (V/STOL) fixed wing aircraft.

In 1961, Mr. Cavage joined the Advanced Design Department of North American-Rockwell (later renamed Rockwell International) in Los Angeles. Here he began a 34 year career of advancing through the Advanced Design Department ranks being given increasing scope of responsibility as his experience expanded. During this period he was in charge of all advanced engineering for Rockwell Cold War air-to-ground fighter-bomber projects. This included overseeing the operations analysis, multi-discipline design and analysis functions with full life cycle cost control responsibility.

For several years he was program manager for a Rockwell Lift-Fan V/STOL program where he directed the design and technology development for commercial V/STOL transports and Navy multi-mission carrier-based aircraft. During this period he was accepted as an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and became a member of the AIAA Technical Committee responsible for policy guidance of the institute in the area of V/STOL aircraft.

Mr. Cavage’s longest project association, and the one project he participated in through the whole evolutionary cycle from concept through production and operation, was the B-1 bomber. He was part of a core engineering team assembled in 1964 responsible to evolve the mission and design requirements for a strategic system that would have a useful combat service life of at least 20 years in an environment of constant technological evolution. The B-1 incorporated several radical new technologies never publicized because of the desire to keep their existence unknown to those who would want to copy them or find effective combat

countermeasures. The system is still very active in the U.S. Air Force inventory and continues to have a quiet role in both Afghanistan and Iraq.

In 1978 an event occurred that would start Mr. Cavage, unknowingly, on a second career. An out of control wildfire burned to within a quarter mile of his recently acquired new home, which was saved only because the wind changed direction! In 1980 he devoted eight months of his personal time to a comprehensive evaluation of the brush fire problem in his community. This study concluded that helicopters and appropriate fixed wing aircraft could significantly improve the brush fire suppression capabilities locally available at that time.

A few years after his aerospace retirement, in the year 2001, he joined the parent organization of Wildfire Research Network to dedicate a significant portion of his energies to helping find truly effective and affordable means to significantly reduce or eliminate the destructive losses now being suffered by so many people because of runaway wildfires.

Currently he is president of Wildfire Research Network, a non-profit corporation dedicated to improving wildfire suppression and control throughout California and the United States.