TESTIMONY

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Thank you Chairman Bishop, Ranking Member Grijalva, and members of the Committee. I am delighted to appear before you today to discuss the single most important issue facing the nation – whether or not we can we prevent the extreme drought and wildfires ravaging the country today from becoming the normal weather for the nation.

My name is Dr. Joseph Romm. I am a Senior Fellow at the Center for American Progress Action Fund, a tax exempt organization dedicated to improving the lives of Americans by transforming progressive values and ideas into policy. I am also the Founder and Editor of Climate Progress, CAPAF's acclaimed climate and energy blog. I earned a Ph.D. in physics from the Massachusetts Institute of Technology.

From 1993 to 1995, I was special assistant for policy and planning to the Deputy Secretary of Energy. I served as Principal Deputy Assistant Secretary and then Acting Assistant Secretary at DOE's Office of Energy Efficiency and Renewable Energy from 1995 to 1998. I have written 7 books and dozens of articles on global warming and climate solutions, including *Hell and High Water* and "The Next Dust Bowl," published in the journal *Nature* in October 2011, from which some of this testimony is derived and where references may be found. I first testified in front of the House of Representatives on energy issues in 1995.

My testimony will provide analysis and data and analysis to support 3 key points:

1. Climate scientists have long predicted that drought and wildfires would become more frequent and more intense because of human-generated carbon pollution that leads to climate change.
2. The current droughts and wildfires we are now seeing – and the bark beetle infestation that may have exacerbated some of the fires – have clearly been made far more likely and far worse by climate change according to many climatologists.
3. If we stay anywhere near our current carbon pollution path, much of the Midwest and Great Plains will be subject to near-permanent and irreversible conditions worse than the 1930s Dust Bowl by shortly after midcentury. Large parts of the south would be uninhabitable by 2100.

Wildfires are most frequent and most intense during extended droughts and heat waves, which creates kindling in the form of very dry trees and grasses. A basic prediction of climate science is that many parts of the world will experience longer and deeper droughts and heat waves, thanks to the synergistic effects of drying earth, warming atmosphere and melting glaciers. Precipitation patterns are expected to shift, expanding the size of the dry subtropics, which would make much of the southwest more arid.

Warming causes more evaporation of surface and subsurface moisture. Where it is dry, the sun's energy goes into baking soils. That's why the United States set so many temperature records during the 1930s Dust Bowl. And it's why, in the summer of 2011, drought-stricken Texas and Oklahoma experienced the hottest summer temperatures ever recorded for a state, beating the previous record holder, 1934 Oklahoma, by more than 1° Fahrenheit.

Also, many regions were predicted to see experience earlier snowmelt, so less water is stored on mountaintops for the summer dry season. These factors increasingly add to natural variability, such as the El Nino–La Nina cycle, greatly intensifying seasonal or decade-long droughts.

Some refer to the confluence of these processes as desertification, but these areas will not have the high biodiversity that characterizes many deserts. "Dust-Bowlification" is perhaps a more accurate and vivid term, particularly since many Americans still believe climate change will only affect far-away places in far-distant times. Prolonged drought will have dramatic international impacts, but it is surprising to many to see it hitting the American heartland so hard so soon.

The coming droughts ought to be a major driver -- if not the major driver -- of federal policy. Yet few policymakers and journalists are focusing on the looming Dust-Bowlification and its potentially devastating impact on food security and our economy. That's partly understandable, since much of the key research post-dates the 2007 Fourth Assessment by Nobel Laureate Intergovernmental Panel on Climate Change (IPCC). Raising public awareness of, and scientific focus on, the likelihood of severe impacts is the first step in prompting action.

This concern isn't new. As far back as 1990, scientists at NASA's Goddard Institute of Space Studies warned that severe to extreme drought in the United States, then happening every 20 years, could become an every-other-year phenomenon by mid-century. Climatologist Jonathan Overpeck detailed the risks in a 2005 talk, pointing to the emerging evidence that temperature and annual precipitation were headed in opposite directions over many regions. He and raised the question of whether we are at the "dawn of the super-interglacial drought.

Events have begun to bear these worries out. More than two decades ago scientists forecasted snowpack reduction, earlier snowmelt, and reduction of dry season river flow in the American. Now there is measurable data demonstrating their occurrence. In much of the northern Rocky, Sierra Nevada, and Cascade Mountain ranges, the peak of the annual stream runoff is as much as 3 or 4 weeks earlier than it was a half century ago. Heat and drought have also made these areas more hospitable to invasive, such as the bark beetle, increase tree/forest/fauna/vegetation die-offs and wildfire risk. Climatologists studying a huge 3-million-acre die-off of vegetation in the Southwest in 2002-2003 warned that it "may be a harbinger" of things to come.

The wildfire season is now a month longer. As the *New York Times* reported, U.S. Forest Service Chief Tom Tidwell testified before the U.S. Senate last year that:

> "Throughout the country, we're seeing longer fire seasons, and we're seeing snowpacks that, on average, are disappearing a little earlier every spring," he said, as well as devastating droughts. As a result, fire seasons have lengthened by more than 30 days, on average. "**Our scientists believe this is due to a change in climate**," said Tidwell.

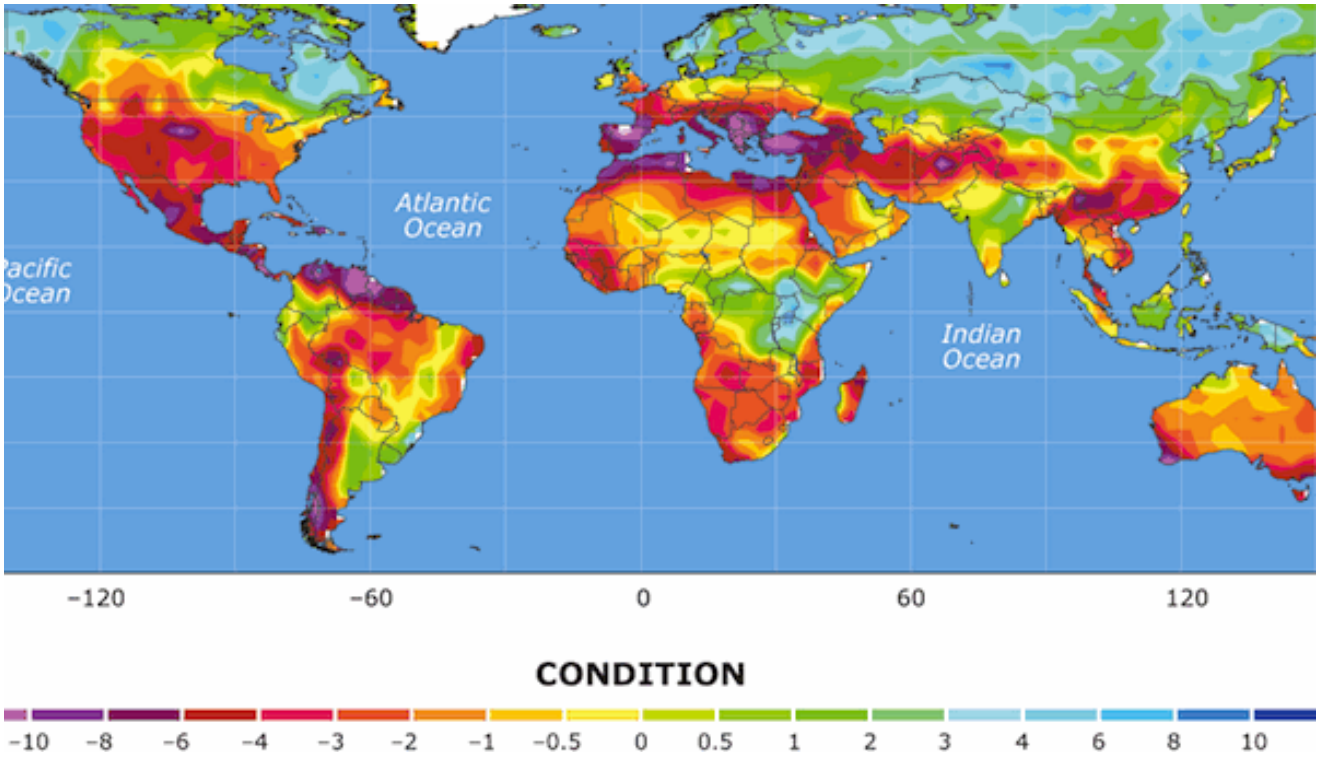
The paleoclimate record dating back to the medieval period reveals droughts lasting many decades. But the extreme droughts the United States faces this century will be far hotter than the worst of those: The driest decade of the worst drought in the past 1,200 years wasn't as warm as recent decades.

Projections call for far warmer conditions ahead. Warming over mid-latitude land masses, like the United States, is projected to be considerably higher than the forecasted average global warming. Much of the inland United States faces warming of 9°F to 15°F based on our current carbon pollution path (i.e. 'business as usual') by century's end, with much of that warming occurring by midcentury.

A 2007 article in the journal *Science* that examined 19 climate projections estimated that levels of aridity comparable to the 1930s Dust Bowl could stretch from Kansas to California by mid-century. To make matters worse, the areas in threat of reduced water supplies have also seen a massive population boom. The top 10 fastest-growing states include Nevada, Colorado, Texas, Arizona, and Utah. Also, water over-use in such areas has long been rife, depleting groundwater supplies.

It is not just our country that faces these issues. Since 1950, the global percentage of dry areas has increased by about 1.74 percent of global land area per decade. Recent climate studies have projected 'extreme drought' conditions by midcentury over some of the most populated areas on Earth -- southern Europe, Southeast Asia, Brazil, the U.S. Southwest, and large parts of Australia and Africa. This can be seen in the following map by Aiguo Dai of the National Center for Atmospheric Research, from his 2010 study.

The Palmer Drought Severity Index mid-century in a moderate emissions scenario.



In the Great Plains during the Dust Bowl, the Palmer Drought Severity (PDSI) spiked very briefly to -6, but otherwise rarely exceeded -3 for the decade. Dai found that:

> "**By the end of the century, many populated areas, including parts of the United States and much of the Mediterranean and Africa, could face readings in the range of -4 to -10. Such decadal averages would be almost unprecedented.**"

These Dust Bowl-like drought conditions are projected to worsen for many decades and be "largely irreversible for 1000 years after emissions stopped," according to a major 2009 study led by researchers at the The National Oceanic and Atmospheric Administration (NOAA).

The most pressing question is what will happen to our food security if Dust Bowl conditions become the norm for both food-importing poorer countries and food-exporting richer countries, including the United States? Extreme, widespread droughts will occur at the same time as sea level rise brings salt-water deep into some of the world's richest agricultural deltas, such as the Nile and Ganges. Meanwhile, ocean acidification, warming and overfishing may severely deplete the availability of seafood.

What are the implications for the global carbon cycle? Increased wildfires release carbon stored in forests and soils, creating an amplifying feedback that further warms the planet – a vicious circle that leads to yet more wildfires.

Adaptation to offset or minimize the worst impacts of prolonged, extreme drought conditions is difficult or impossible. Historically, the primary 'adaptation' for Dust-Bowlification is human abandonment of afflicated areas. The very word "desert" comes from the Latin *desertum for* "an abandoned place". This occurred eighty years ago when hundreds of thousands of families fled during the relatively short-lived U.S. Dust Bowl of the 1930s. Experts predict huge mass migration due to drought and famine from global warming, particularly in Africa. This could initiate a humanitarian aid crisis of epic proportions, a scenario many retired generals and admirals fear because our military would be part of the responses, and such instability would threaten our national security.

We must plan for how the nation and the world will deal with steadily growing regions of non-arable land right in the heart of populated countries and global bread-baskets. We must plan for these drought-spurred migrations – globally and here at home. As the above map shows, much of northern Mexico is projected to become a Dust Bowl too.

The inexorable conclusion is that **feeding the world's 9 billion people by mid-century in the face of a rapidly warming climate with extreme droughts may well be the greatest challenge the human race has ever faced**.

Moreover, these predictions are not worst-case scenarios: They rely on business as usual estimates of future carbon pollution. We can hope the models are too pessimistic, but some changes, like expansion of the subtropics, already appear to be occurring faster than the models projected. It is clear we need to pursue the most aggressive carbon-pollution mitigation policies promptly, and put warming-driven Dust-Bowlification atop the national agenda.

Again this is not a new or sudden prediction. In fact, a decade ago climate scientists around the world were figuring out the same thing – we are speeding toward a climate cliff with our foot on the accelerator. I summed up some of their research back in six years ago:

> Since the 1970s, the number of "very dry areas" on the planet, as defined by the widely used Palmer Drought Severity Index, has more than doubled, to about 30 percent of the global land. As a major study by the National Center for Atmospheric Research concluded, "These results provide observational evidence for the increasing risk of droughts as anthropogenic [human caused] global warming progresses and produces both increased temperatures and increased drying."
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> Not surprisingly, but rarely reported in context, wildfires have been on the rise worldwide for half a century. Every decade since the 1950s has seen an increase in major wildfires in the United States and around the world.
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> Large parts of the country have been getting hotter and drier, and suffering extended droughts….
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> Not only do drought and high temperatures increase the number of wildfires, they also lead to a greater range of pests that feast on trees whose defenses have been weakened by heat and lack of water. Trees from the Southwest up to Alaska are dying by the millions.
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> A 2005 study led by the University of Arizona, with the Los Alamos National Laboratory and the U.S. Geological Survey, examined a huge 3-million-acre die-off of vegetation in 2002–2003 "in response to drought and associated bark beetle infestations" in the Four Corners area (Arizona, New Mexico, Colorado, and Utah). This drought was not quite as severe as the one that region experienced in the 1950s, but it was much warmer, hence it fit the global-warming model. The recent drought had "nearly complete tree mortality across many size and age classes," whereas "most of the patchy mortality in the 1950s was associated with trees [more than] 100 years old."
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> Most of this tree death was caused by bark beetle infestation, and "such outbreaks are tightly tied to drought-induced water stress." Healthy trees defend themselves by drowning the tiny pine beetles in resin. Without water, weakened, parched trees are easy meals for bugs.
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> "We're seeing changes in [mountain pine beetle] activity from Canada to Mexico," said Forest Service researcher Jesse Logan in July 2004, "and the common thing is warming temperatures." According to the Department of Forest Resource Management at the University of British Columbia, the beetle infestation has spread to higher and more northern regions thanks in large part to climate change. And milder winters since 1994 have reduced the winter death rate of beetle larvae in Wyoming from 80 percent per year to under 10 percent.
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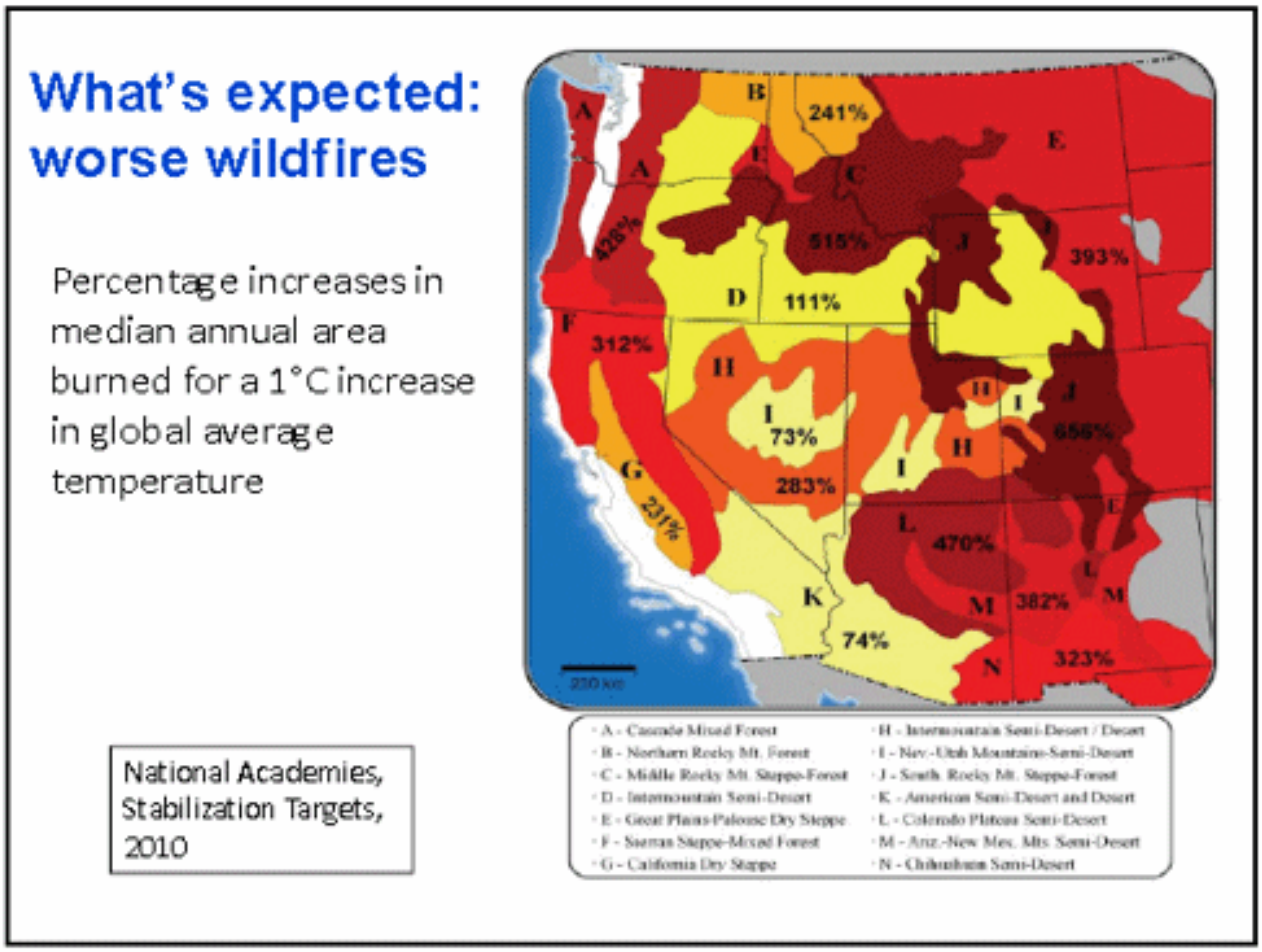
> In a February 2006 speech on climate change, Senator Lisa Murkowski of Alaska pointed out that the tremendous recent warming had opened the door to the "voracious spruce bark beetle," which devastated more than 3 million acres in Alaska, "providing dry fuel for outbreaks of enormous wild fires." Half of the wildfires in the record-breaking 2005 season were in Alaska.

And as the members know, the bark beetle has continued to spread throughout the West, devastating trees in states like Montana and Colorado. That's because climate change favors invasive species.

In 2009, in a detail report on the impacts of climate change on this country, the U.S. Global Change Research Program said:

> Wildfires in the United States are already increasing due to warming. In the West, there has been a nearly fourfold increase in large wildfires in recent decades, with greater fire frequency, longer fire durations, and longer wildfire seasons. This increase is strongly associated with increased spring and summer temperatures and earlier spring snowmelt, which have caused drying of soils and vegetation.

Here's the grim projection from a presentation made by the President's science adviser Dr. John Holdren in Oslo in 2010:



We can barely manage the wildfires we have today. How exactly would much of the West "manage" a 4-fold to 6-fold increase in wildfires? And that's just from a 1.8°F increase in temperatures. Again, we could see 5 times that this century.

As Tom Kenworthy, longtime environmental reporter and now Senior Fellow at American Progress, reported this month on Climate Progress, wildfires have multiple causes:

> It's impossible to link any one particular fire or weather event to climate change. In the case of fires in the West, there are other factors as well: more people living in fire-prone areas in and near forests and unnaturally crowded forests brought on in large part by decades of misguided efforts to battle and suppress nearly all fires.
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> But federal scientists and officials whose responsibilities include management of the vast national forest system in the West are increasingly saying flat out that there is an undeniable link between wildfires and climate change.
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> The Agriculture Department official who oversees the U.S. Forest Service, Under Secretary Harris Sherman, noted recently that 10 states have had record fires in the past decade. "The climate is changing," Sherman told *The Washington Post*, "and these fires are a very strong indicator of that."
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> "There's enough data that show fires are very clearly linked to warming," U.S. Geological Society Research Ecologist Craig Allen recently told a symposium sponsored by the Aspen Center for Environmental Studies. "Fire season's about two months longer than it used to be."

The longer season is just the start. The National Interagency Fire Center in Boise, Idaho, reported that the wildfires are becoming more destructive—the total acreage burned has skyrocketed in recent decades:

> During the four decades of the 1960s through the 1990s, the annual acreage burned by wildfire averaged 3 million acres. Between 2000 and 2009 the average year saw 7 million acres burn.
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> Between 1960 and 1995 there were just five years where the acreage burned exceeded 5 million. Between 1996 and 2011, 11 of the 16 years exceeded 5 million acres burned, including 8 of the past 10 years.
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> As of early July, fires have burned about 2.4 million acres, according to the National Interagency Fire Center. And the outlook for the rest of the summer and early fall is not rosy, the center reports. Much of the West—from northern Arizona and northern New Mexico to southern Montana, across Nevada, and into parts of California—will have above-normal fire potential through the remainder of July. From August to October large swaths of Wyoming, Montana, Idaho, Utah, Nevada, and California will have above-average fire potential due to drought, fuel conditions, and El Niño, which causes sea temperatures to rise.
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> Various federal initiatives since the 1990s have sought to address the questions surrounding forest fuel loads and how to better manage them to moderate the wildfire threat, either by reintroducing fire, by thinning crowded forest stands using logging tools, or a combination of both methods. The results are questionable at best.

A recent Congressional Research Service paper on wildfire protection reviewed the science on whether such interventions work and concluded:

> The presumption is that lower fuel loads and a lack of fuel ladders [underbrush and small trees that carry fire into the tops of larger trees] will reduce the extent of wildfires, the damages they cause, and the cost of controlling them. Numerous on-the-ground examples support this belief. However, little empirical research has documented this presumption. As noted in one research study, "scant information exists on fuel treatment efficacy for reducing wildfire severity."

Kenworthy discusses the efficacy of fuel treatment -- thinning dense forests and using prescribed burns to eliminate surface fuels:

> Despite that research ambiguity, fire years such as the current one almost always spur calls for large-scale efforts to thin overgrown forests and return them to a more natural condition, particularly in what is called the "wildland-urban interface." That awkward phrase is sometimes defined as "where combustible homes meet combustible vegetation."
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> Sherman, speaking to the recent Aspen conference, said that, "We need to move forward with landscape-scale restoration. Too often we have conservation projects where we're working on a hundred acres here or a hundred acres there. We need to move into an entirely new and expanded scope of work."
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> That demand for larger restoration is partly driven by the extraordinary costs of fighting fires. Between fiscal year 2000 and fiscal year 2010, fire suppression appropriations by Congress rose from less than $300 million to nearly $1.4 billion, according to a 2011 Congressional Research Service paper on federal funding of wildfire activities. At the same time federal spending on fuel reduction rose from $117 million in fiscal 2000 to $400 million the next year and has largely remained in the $400-million-to-$500-million range since.
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> The cost of an ambitious forest restoration effort would be huge. In a 1999 report the U.S. General Accounting Office (now the Government Accountability Office) estimated it would cost $12 billion to treat the 39 million Forest Service acres at the time thought to be at high risk of catastrophic wildfire. Since then the Forest Service has raised its acreage estimate to 51 million acres, and the estimate of a $300-per-acre treatment cost has probably become obsolete. Further, the original estimate did not include other federal lands beyond Forest Service areas.

The Congressional Research Service paper on wildfire protection noted, "If a comprehensive program were undertaken to reduce fuels on all high-risk and moderate-risk federal lands, using GAO's treatment cost rate of $300 per acre, the total cost would come to $69 billion."

The CRS reported noted "There is a final, significant question. Would it work?" They concluded

> Reducing fuel loads might reduce acreage burned and the severity and damages of the wildfires that occur. Research is needed … to examine whether the cost of fuel reduction is justified by the lower fire risk and damage. However, it should also be recognized that … as long as there is biomass for burning, especially under severe weather conditions (drought and high wind), catastrophic wildfires will occasionally occur, with the attendant damages to resources, destruction of nearby homes, other economic and social impacts, and potential loss of life.

Kenworthy concluded his analysis:

> **In a warming world we can expect those things will happen more often and with greater intensity, as we are seeing this summer. The bottom line is that climate change is a major cause of these fires, and climate solutions should become part of the effort to tame them.**

All three pieces of legislation today seek to address the wildfire and insect issue by accelerating and increasing forest thinning. The scientific support of fuels treatment as a wildland fire mitigation strategy is spotty at best. As the subcommittee considers legislation, I urge you to ensure that federal agencies maintain the flexibility to undertake projects based on the best scientific information available. As you know, new studies come out daily and can inform best management practices. I am concerned that H.R. 5744 sponsored by Congressman Gosar and H.R. 6089 sponsored by Congressman Tipton mandate the implementation of projects and lock in a certain management approach for 10 to 20 years. Congressman Markey's legislation, H.R. 5960 allows a more scientifically based approach to addressing the insect issue by providing for accelerated consideration of project but on a pilot basis.

The bottom line is that the climate is changing just as the climate scientists have predicted for decades. Dr. Overpeck told the AP this month,

> "**This is what global warming looks like** at the regional or personal level. The extra heat increases the odds of worse heat waves, droughts, storms and wildfire. **This is certainly what I and many other climate scientists have been warning about**."

Now scientists are warning that if we fail to act quickly to curtail greenhouse gas emissions we may destroy the breadbasket of the world and may render large parts of the United States – including many of the districts you represent -- all but uninhabitable, possibly for centuries. Will we finally make the carbon pollution reductions essential to reduce the worst impacts of climate change, or will Congress keep ignoring the warnings about the fires yet to come?