

# Summary: Wildland Fire Research

February 2013



HEADWATERS  
ECONOMICS

**THE PROBLEM:** The price of fighting forest fires has been increasing substantially. At the national level, fire costs represent nearly half of the U.S. Forest Service's budget and total expenses have exceeded \$3 billion annually, more than twice what it cost a decade ago. Unfortunately, this expense is almost certain to continue to grow, and—unless action is taken—firefighting costs could double again in the next 15 years because of expanding residential development on fire-prone lands and increased temperatures associated with climate change.

**THE RESEARCH:** Headwaters Economics has conducted research into several major areas (<http://headwaterseconomics.org/wildfire>):

- (1) Homes in the Wildland-Urban Interface (WUI) and Costs of Fighting Fires
- (2) Case Study: Cost of Protecting Homes and Impact of Warming Temperatures in Montana
- (3) Case Study: Fire Fighting Costs in the Sierra Nevada
- (4) Case Study: Fire Fighting Costs in Oregon
- (5) White Paper: Ten Ways to Control Fire Suppression Costs

## SUMMARY:

(1) **Wildland-Urban Interface:** <http://headwaterseconomics.org/interactive/wui-development-and-wildfire-costs>.

Using 2010 Census data we found that 84 percent of private lands near fire-prone public forests in the West today are undeveloped, and new building in these areas will increase future firefighting costs for U.S. taxpayers by billions of dollars. We provide data for both county-by-county and state-level analysis, along with rankings for the 11 continental western states.

Key findings of our research include:

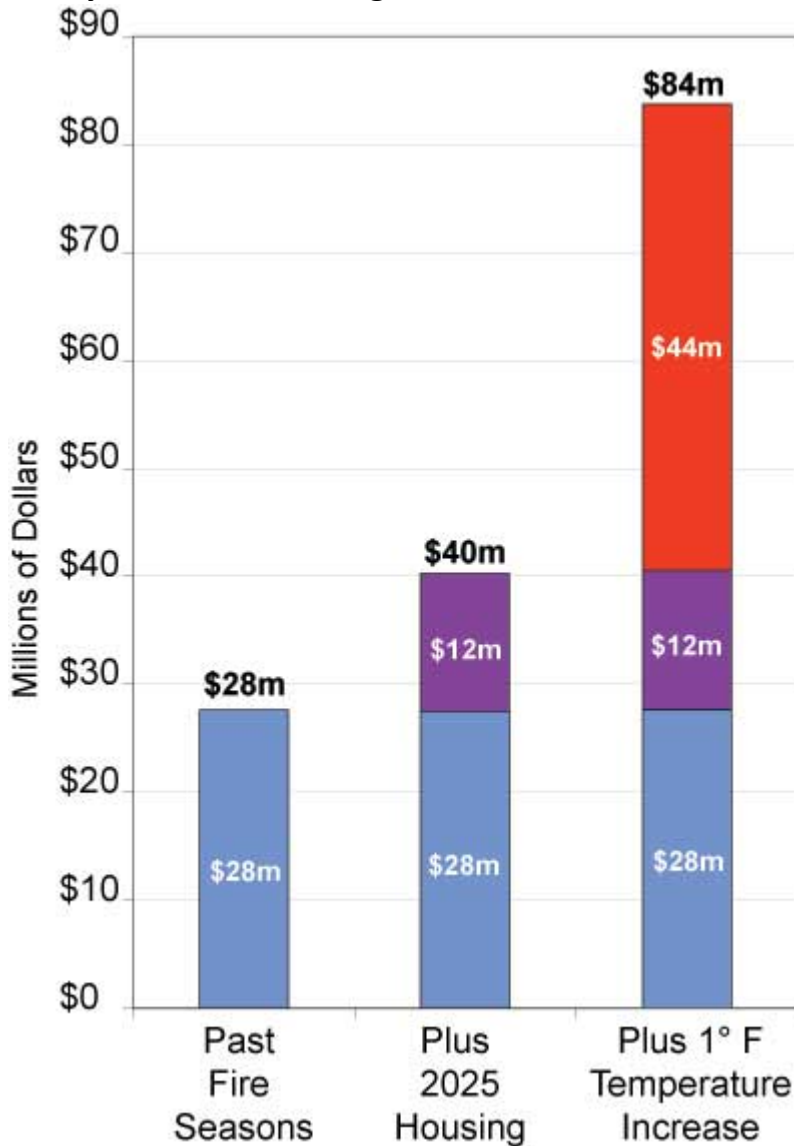
- Only 16 percent of forested western private land adjacent to public land is currently developed for residential use.
- If just half of the WUI is developed in the future, annual firefighting costs could explode to between \$2.3 and \$4.3 billion. By comparison, the Forest Service's total average annual budget is \$5.5 billion.
- Fifteen percent of the homes in the wildland-urban interface are a second home or cabin.
- According to the U.S. Department of Agriculture's Office of Inspector General, for example, protecting private property from forest fires consumed between 50 percent and 95 percent of all firefighting costs.
- Oregon has 5,130 square miles of forested private land bordering public lands, of which 89 percent has not yet been developed.
- Washington has the most homes built next to public forestlands--951,468--and the largest share of WUI already developed (29%), but still has 3,211 square miles of WUI with the potential to be developed.
- In Colorado, 40 percent of homes in the WUI are second homes and 80 percent of the WUI remains undeveloped.
- Montana has 2,666 square miles of undeveloped WUI and only nine percent is developed.

(2) **Montana Case Study:** <http://headwaterseconomics.org/wildfire/montana-wildfire-costs/>.

Using Montana as a case study, Headwaters Economics found that protecting the average home from a wildfire event costs roughly \$8,000 and that 27 percent of firefighting costs are attributable to protecting homes in the WUI. Statewide, protecting homes from forest fires costs an average of \$28 million annually. If development on private land near fire-prone forests continues, costs associated with home protection likely will rise to \$40 million by 2025.

Climate change would increase costs even further. An average summer increase 1° F in Montana would at least double home protection costs, and the combination of additional development and hotter summers could push the average annual cost of protecting homes from forest fires to exceed \$80 million by 2025.

**Yearly Cost of Protecting Homes from Wildfires in Montana**



### (3) Sierra Nevada Case Study:

<http://headwaterseconomics.org/wildfire/northern-california-homes-and-cost-of-wildfires/>.

This research focuses on how growing residential development near the twelve national forests in the Sierra Nevada area of California has led to increases in fire suppression costs. The research focused on 27 wildland fires during 2006-2009.

Key findings of our research include:

- Rising average summer temperatures are strongly associated with an increase in acres burned. Within the Sierra Nevada study area, an increase in average summer temperature of 1° F is associated with a 35 percent increase in area burned by wildfires.
- Increases in sprawl and the area burned by wildfire have led to greater numbers of homes being threatened. During the past ten years twice as many homes (approximately 13,000) were within a mile of a wildfire compared to the 1980s or 1990s. Home building has increased rapidly in the Sierra Nevada area. Since 1950, more than 900,000 homes were built in the study area, and 1,500 square miles of undeveloped private land were converted to low density development.
- For fires in the Sierra Nevada, one-third of suppression costs are related to protecting homes. For the average U.S. Forest Service wildfire, 35 percent of total firefighting costs in the study area are associated with protecting homes. The cumulative cost of the 27 wildfires in the study was \$496 million, of which we estimate \$173 million were suppression costs related to homes.
- Additional firefighting costs associated with new homes depend on how many homes already are present. On average, the total estimated cost to protect a home within six miles of a fire was \$81,650, but ranged significantly from \$1,513 to \$683,928. In low density areas, the cost of adding a single home can be incredibly high. If only one home is within six miles of a fire, the additional cost of a new home is \$57,151 daily—or \$2 million for the duration of a 35 day fire. By comparison, a new home added to a development of 50 existing homes costs \$1,143 daily or \$40,000 for the duration of a 35 day fire.

This research has two central policy implications:

- Keeping new housing within denser residential areas would reduce future firefighting costs by millions of dollars. Leaving land undeveloped saves the most taxpayer dollars.
- Today federal and state taxpayers pay a large portion of the cost of wildfires. If costs instead were borne in part by those who build at-risk homes, or by local governments who permit them, it would help pay for rising costs and may discourage new home development in high risk areas.



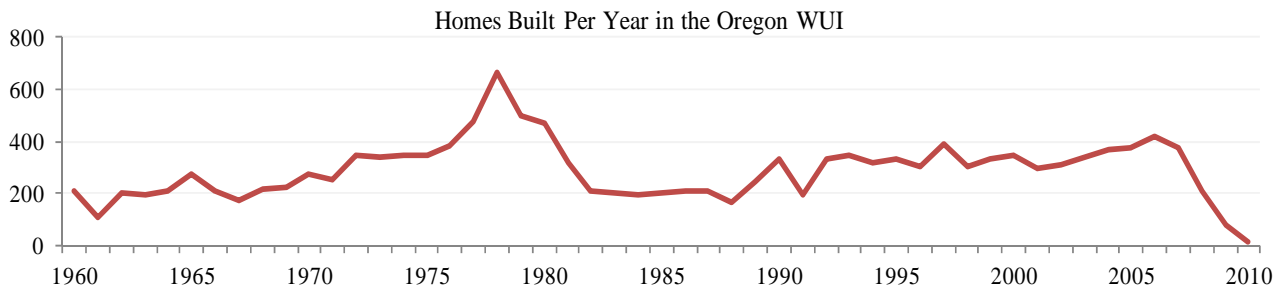
#### (4) Oregon Case Study

<http://headwaterseconomics.org/wildfire/oregon-homes-and-cost-of-wildfires/>

This recent research demonstrates how growing residential development in Oregon has led to increases in fire suppression costs. The research focused on 33 wildland fires during 2006-2010.

Key findings of our research include:

- Rising average summer temperatures are strongly associated with an increase in the number of wildfires. In Oregon, an increase in average summer temperature of 1° F is associated with an increase of 420 wildfires. This is a large effect given that, on average, 1,800 wildfires burn in Oregon per year.
- Based on data for 19 Oregon counties, home construction in the WUI was most rapid from 1977-1980, when an average of 529 WUI homes were built per year. The next highest rate occurred in 2006, just prior to the recession, when 418 WUI homes were built.



- Of the 33 Oregon wildfires studied, the average cost to protect a home within 6 miles of the fire was \$56,614, but ranged significantly, in some fires costing more than \$200,000 per home. The estimated cost related to housing for the 33 study fires ranged from none to 42 percent, and averaged 17 percent. This added up to almost \$42 million spent to protect homes (out of a total firefighting bill of more than \$250 million).
- Building new homes in otherwise undeveloped areas has the greatest potential to increase firefighting costs. Conversely, lower firefighting costs are associated with individual homes in densely developed areas. This is likely because when large numbers of homes are present, fire managers are already investing all available resources to stop the fire. For example, using the average daily firefighting cost within our sample (\$700,911), the model predicts an increase in suppression costs of \$31,545 if two homes instead of one were within 6 miles of the wildfire. By comparison, the model predicts an increase of only \$319 if 100 homes instead of 99 were within 6 miles of the wildfire.

This research, like the California work, has two central policy implications:

- Keeping new housing within denser residential areas would reduce future firefighting costs by millions of dollars. Leaving land undeveloped saves the most taxpayer dollars.
- Today federal and state taxpayers pay a large portion of the cost of wildfires. If costs instead were borne in part by those who build at-risk homes, or by local governments who permit them, it would help pay for rising costs and may discourage new home development in high risk areas.

**(5) White Paper: Ten Ways to Control Fire Suppression Costs:**

<http://headwaterseconomics.org/wildfire/fire-suppression-costs/>.

Previous efforts to hold down or reduce fire suppression costs—such as increased coordination among agencies and educating homeowners how to live more appropriately near fire-prone lands—focus on increasing the safety of existing residences in the WUI.

Unfortunately, these proposals lacked the means to control future costs—which are driven by more frequent, larger fires and growing numbers of homes in the WUI—and may have unintentionally helped increase residential growth and subsequent fire suppression costs near fire-prone lands.

Another important concern is that the current approach to fire suppression has perverse incentives and lacks accountability. People who develop in forested areas, and local governments that allow such new subdivisions, do not pay their share of firefighting costs. Instead, the majority of firefighting expenses instead are paid by the Forest Service, Bureau of Land Management, and the Federal Emergency Management Agency. Because the national taxpayer pays the tab and—as long as someone else is paying the bill—those who build or permit the development of homes in dangerous, fire-prone landscapes have little incentive to change.

While the home building is not the only reason firefighting costs have increased—a warmer climate and fuel buildup from past practices also play a role—future policies and growth in the WUI is an area where communities can make progress.

This white paper provides ten policy ideas for controlling the rise of firefighting costs.

- (1) Publicize maps identifying high-risk wildfire areas.
- (2) Educate officials and the public about the financial consequences of building in fire-prone areas.
- (3) Redirect federal aid to encourage land use planning on private lands.
- (4) Provide incentives for counties to sign firefighting cost-share agreements.
- (5) Purchase land or obtain easements on fire-prone lands.
- (6) Institute a national fire insurance and mortgage program to require home firefighting insurance.
- (7) Allow insurance companies to charge higher premiums in fire-prone areas.
- (8) Limit development near fire risk lands through planning or local zoning.
- (9) Eliminate mortgage interest tax deductions for homes built in the WUI.
- (10) Reduce the federal firefighting budget, forcing cost transfers to the local level where land development decisions are being made.

**Contact:** Patricia Gude, 406-599-7426, [patty@headwaterseconomics.org](mailto:patty@headwaterseconomics.org)  
Ray Rasker, Ph.D. 406-570-7044, [ray@headwaterseconomics.org](mailto:ray@headwaterseconomics.org)