

WEEDS: WIND ENABLED EMBER DOUSING SYSTEM

**A New Idea For
Home Protection**

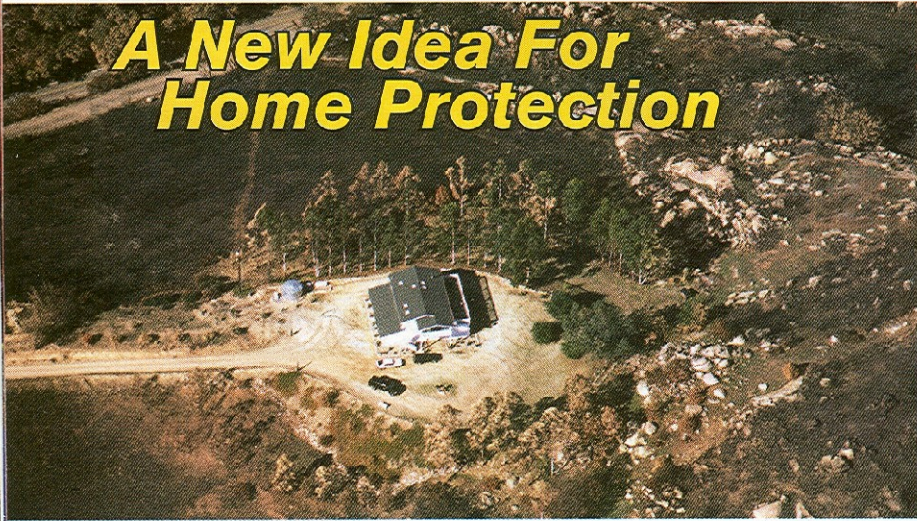


Photo by Nantette Martin

by Joe Mitchell

An aerial view of the authors home after the Cedar Fire in California.

Preparing for wildland fire properly requires that you prepare for the worst-case you can imagine. If your nightmare actually comes to pass, if you are faced (as we were) with a 20-mile wall of 70-foot flame marching toward you, you will probably think (as we did) that none of your preparations could be up to meeting such a horrendous force of nature. That, of course, is not true. Our home did survive, thanks to preparation, good fortune, and invention. The invention part consisted of a sprinkler system that is designed to turn the forces of nature to our advantage, and to close the gap that is most likely to destroy an otherwise prepared home in the wildland-urban interface.

Australian fire officials and fire scientists have long known that the greatest threat to homes in "bushfires" is the ember attack that occurs prior to and during the passing of the flame front. The embers start smoldering fires, which can ignite structures well after the fire has passed. Slowly, American firefighting officials are coming to understand the importance of ember attack during catastrophic wildfires, as has been acknowledged in the post-mortem analyses conducted after the 2003 Southern California wildfires.

Burning embers, known as "firebrands" or just "brands", have been shown to ignite homes up to one mile from the fire front. No amount of fuel modification is going to protect against this. Statistically, the wildfires that destroy the most homes are huge and out of control, and they become that way because they are driven by high winds. These winds carry embers. Accordingly, fire officials and now fire codes, are requiring structural modifications

for new construction to help protect against embers: non-combustible siding and roofing, sealed soffits, and metal screening over vents. However, a chain breaks at its weakest link, and wind-driven embers can find any flaw in planning or temporary lapse of attention.

Our home has wood frame and siding. We purchased it when we were new to the area. We knew that fire was a threat, and my wife, Diane Conklin, took on the job of our home fire marshal. When the nearby Fallbrook fire occurred, she obtained a tape of news helicopter footage taken of homes that were burning along a ridge like ours. We noticed a very odd thing: often the vegetation and trees near a burning home would still be intact. To me, this argued for wind-driven embers as being the cause of ignition.

Diane had been arguing for a sprinkler on the roof, as suggested in a California Department of Forestry video she'd obtained, but I

Design Requirements For The WEEDS System:

- Four hours of active protection once started
- Sufficient spray to extinguish embers/firebrands
- Continued operation in the event of water & power loss
- Protects footings, walls, recesses, window, gutters, under eaves, and roof
- Active protection for wind speeds from 15 to 60 mph

**Note that WEEDS is intended to supplement, and not replace, other fire-safe home protection measures.*

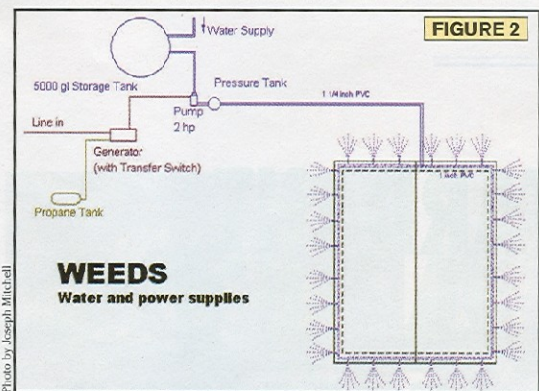
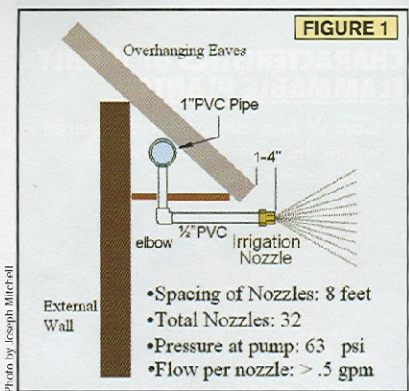


FIGURE 1: The key to WEEDS is the nozzles facing away from the house.

FIGURE 2: A backup water and power source are necessary to insure continued protection.

didn't think that it would work when the Santa Ana winds began to blow. I consulted with a neighbor of ours, who is a retired fire captain, to find out what sort of conditions we could expect in a typical fire that would threaten our home. He warned us not to expect help from our local fire services, arguing that under typical Santa Ana conditions most of our resources would be sent north to fight other fires before local fires even began. He agreed about the winds and the embers that would be driven forward "like tracer bullets."

I came up with the following idea: if the sprinklers were directed away from the house, then a strong wind would blow the spray back onto it. In this way we could cover walls, footings, eaves, and roof with one set of sprinklers mounted under the eaves. Any place that embers would be likely to strike or gather would also be a place that water spray would accumulate, leading to rapid dousing.

With the help of a local contractor, I began prototyping and then constructing our system. We purchased a 5,000-gallon tank for our water supply and a pump. We ran piping for the sprinklers under the eaves, which were then sealed with plywood. Every eight feet we'd put in a nozzle. Undereaves1.jpg

We purchased and installed a backup generator with automatic transfer switch in the summer of 2003. The installation was

approved by the county inspector on Friday, October 24. Forty hours after we first tested the generator, the Cedar Fire overran our property.

It was our intention to evacuate during a wildfire and let our home defend itself. Because we are at the end of a dead-end road, and because our driveway skirts what is known in firefighting parlance as a "chimney", we also had to keep in mind the possibility of entrapment. When the Cedar fire struck, we evacuated in the early morning hours of October 26 as it raced along the ridges to the east of us. Neither of us expected to see the house again. The flames on the neighboring ridge towered 70 feet. We left feeling satisfied that we'd done everything reasonable to defend our home, and probably more.

Almost two days passed before we learned our home was standing. Our generator was still running when it was first visited, and the tank had been emptied. The system had worked. Structures were lost on all properties adjacent to ours. Roughly 2/3 of the homes in our neighborhood, which had no professional fire help, had been destroyed.

Looking at the ember damage to our property leads me to believe that our home experienced a significant ember attack, and that probably our system (in conjunction with our other fire-safe measures) was responsible for saving it. I call it WEEDS: Wind Enabled Ember Dousing System, and as far as I've been able to tell the idea of using the wind to disperse the spray is new. I am putting it into the public domain, with the intent that anyone living in the Wildland-Urban Interface should be free to use it.

WEEDS Components:

- 5000 gallon storage tank (used for drinking water too)
- 2 hp water pump
- Pressure tank to help maintain 63 psi line pressure
- 1 1/4" main feed line
- Dual distribution lines; 1" copper on house side to under eaves, 1" PVC under sealed eaves
- 1/2" PVC piping extending out in dogleg through the sealed soffits and out three inches beyond the edge of the eaves
- Irrigation nozzles spaced every eight feet creating a spray, not a mist (We used adjustable brass nozzles with a 45° spray pattern. Adjustability is necessary to compensate for pressure drop along the line.)
- Main activation valve, with branches into independently controllable systems (A drainage valve at the bottom allows purging of the system after use.)
- 12 kw backup propane-fueled generator with automatic transfer switch

How WEEDS Works:

WEEDS protects homes from ember attack in several ways:

- The rain-like spray can directly extinguish embers where it is dense enough (within about 10' of the home).
- Wherever the wind can carry embers into hidden recesses, it will also carry spray from the WEEDS nozzles.
- The wind can roll larger embers along the ground, and many will hit the side of the home and then drop down to the base of the wall. If there is standing water on surfaces on and around the structure, then embers falling in the water will be doused.

Water spray and increased humidity will wet light fuels near the structure, making them much harder to ignite. Leaves, grasses, dried plants, gutter debris, and any other things missed in the last fire-safe cleanup will be rendered nonflammable.