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Prescribed Fire Versus Air Quality in 2000 in the Pacific Northwest[1]

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Abstract: In 1970, it was widely assumed that by 1980 in the Pacific Northwest, prescribed fire would be a thing of the past. By 1985, however, half way from 1970 to the end of the century, the area treated by fire increased. Now, the demise of forest burning is widely expected to occur by the year 2000. Can, and will, a compromise be found between the resurgence in appreciation for fire and the continuing public pressure for improved air quality? The conflict is manageable, provided the current cooperative attitude between forest and air resource managers persists. A 50 percent emission reduction by 2000 seems likely, and 70 percent seems possible, according to projections by fuel managers in the Region.

In 1970, it was widely predicted in the Pacific Northwest that by 1980, prescribed fire would be a thing of the past. The Premier of the Province of British Columbia promised a cessation of slash burning by 1975. Smoke Management was a program that would preside over the phaseout of slash burning. The public demand for air quality would overshadow the forest industry's insistence that catastrophic wildfires would be the inevitable result from a cessation of burning. Other than the threat of wildfire, foresters perceived little threat to productivity. They would have transformed to second-growth management with little or no residues to contend with. Private landowners had largely eschewed fire use, and only the Federal land manager with high-elevation decadent stands would have a compelling reason to burn for site preparation.

By 1985, half way from 1970 to the end of the century, the area in the Pacific Northwest treated by fire had increased substantially. Only a rudimentary smoke management program has been established in British Columbia. Smoke management programs in Washington and Oregon dominate all other considerations in planning prescribed burns, but smoke management has enabled a larger and more effective burn program than before. Hazard reduction has been discredited as a reason to treat slash, yet private landowners have dramatically increased fire use. Only the public sector uses less fire, especially by discontinuing fire for high-elevation site preparation.

Now, the demise of forest burning is widely expected, for the same reasons, to occur by the year 2000. The National goal in the United States to protect visibility impairment in Wilderness, concern for air toxics, and the increasing relative contribution of fire to air quality problems have focused intense regulatory pressure on the practice. Can and will a compromise be found between the resurgence in fire use and the mounting pressure for air quality?

CLEAN AIR, FIRE, OR BOTH?

Smoke management in the Pacific Northwest is a success story. The air resource management agencies, the smoke management coordinators in the State forestry departments, Federal land management agencies, and private industry have

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worked together to find ways to reduce emissions while accommodating a growing prescribed fire program (Sandberg 1984). Forest managers have used an array of techniques to reduce emissions without reducing the area treated with fire. Improved utilization of residues, meteorological scheduling (or "spring burning" when the large woody fuels and duff are too wet to burn), mass ignition, and more selective fire use has been shown to reduce emissions by about 30 percent since the baseline period of 1976 through 1979 (Sandberg 1987).

The National goal to predict visibility impairment in Wilderness has been translated to a regional goal of reducing smoke emissions by 50 percent before the year 2000, therefore, the central question is: can smoke be reduced substantially without distorting forest management goals for the rest of the century? With a history of less-than-accurate forecasting, the author and a group of forest managers in the Pacific Northwest Region of the Forest Service, U.S. Department of Agriculture, predict the future of prescribed fire and air resource management in the year 2000.

Fuel Managers' One Vision

Fuel managers in each of the 19 National Forests in Washington and Oregon were enlisted to create a vision of utilization practices and fire use in the year 2000. The vision is needed to complete an Environmental Impact Statement being prepared by a Vegetation Management Interdisciplinary Team under the direction of Gary Larsen at the Forest Service's Regional Office in Portland, Oregon.

Fuel managers were not asked about air quality. Rather, they were asked to consider the Forest Plans and to use their intuition to describe the many distinctly different prescribed fire situations they might encounter.

Each "situation" was defined by a fuel type (e.g., hardwood timber harvest, second-growth short-needled conifer slash, pine-needle litter, etc.). harvest type (e.g., clearcut, clearcut-and-YUM[3], no harvest, etc.), and fire type (broadcast burn, pile burn, etc.). After the responses were sorted and combined. 211 distinct fire situations were identified.

[3]Yard Unmerchantable Material.

Each fuel manager was then asked to describe the current and envisioned burn program for each of the fire situations. The description included a profile of the fuelbed (e.g., loading of residues 3- to 9-inches in diameter, thickness of the duff and litter, height of live vegetation, etc.), and how the fuel loading is expected to change by the year 2000. Then the number of acres treated were estimated, with the future acres estimated under several alternative vegetation-management scenarios ranging from unrestricted fire and herbicide use to severely restricted. Finally, the distribution of burning by month, age class of slash (months of drying since harvest), and ignition method were described for the current period and for each alternative in the year 2000.

Fire Researchers' Other Vision

Fuel managers' responses were all processed in a large spreadsheet program that contains all of the biomass-consumption and emission-factor predictive equations developed over the years by the author's research project. The same equations are routinely used by foresters to plan prescribed fires and by the States to compile emission inventories in Oregon and Washington (Sandberg and Peterson 1985). The result is an array of predictions for the annual yield of smoke emissions for each National Forest and an analysis of what management practices (area burned, level of utilization, and scheduling for higher fuel moistures) will differ from current practice.

All National Forests in Washington and Oregon projected changes in harvest levels, fire use, utilization standards, and burning schedules, or all of these, to reduce emissions from current levels according to the scenario derived from the preferred alternative(s) in each of the Forest Plans. Only 1 of 19 Forests expects to increase emissions under any of the scenarios owing to a large expected increase in th6 treatment of natural fuels to enhance wildlife habitat.

THE VISION: BOTH CLEAN AIR AND FIRE USE IN 2000

Prescribed fires on National Forests in Washington and Oregon currently produce about 56,000 tons of fine particulate matter per year from 226,000 acres. Oregon accounts for 69 percent of the total smoke production. The biomass consumed per acre averages 65 tons per acre on National Forests in western Washington,

54 tons per acre in western Oregon, 44 tons per acre in eastern Washington, and 29 tons per acre in eastern Oregon.

In the Region, we expect at least a 37 percent reduction in emissions from prescribed fires by the year 2000. Expected reduction in the area burned will reduce emissions by 17 percent, and expected declines in the biomass consumed per unit area will decrease emissions by 25 percent. About one-half of the decrease in biomass consumption will result from improved wood utilization, and the other half from scheduling burns for wetter periods.

A 37 percent reduction of emissions before the year 2000, coupled with the 30 percent reduction already observed since the baseline period, would easily exceed the goal to reduce emissions by 50 percent. Emissions will decrease by 19,000 tons just from changes on the National Forests. Of course, these estimates are preliminary and will be refined and reviewed by the EIS Team and compared with the Forest Plans. Also, the emission reduction goal includes all land ownerships, while this analysis considers only the National Forests. Nonetheless, we can have clean air and prescribed fire too, without drastic departure from current forest management goals.

THE VISION COULD BE OVERULED

The vision is based on the quality of projection the fuel managers surveyed. If they are wrong, either by error of judgment or unforeseen future actions that overrule their vision, the conflict between fire use and air quality will be renewed. There are larger issues ranging from market forces to global climate change that are simply too vague to consider. There may be management policies that put higher priorities on potential health risk from exposure to smoke or potential productivity loss from extra utilization that will overrule the present compromise between foresters and air resource managers.

THE VISION DEPENDS ON FUTURING

We can form a vision either from global perceptions or stepwise analysis of smaller components of change. It is easy to perceive a global scenario where we will no longer use fire in forest management. In 1970, our global prediction was for the cessation of fire use, but we never verified the small components of change that would complete that vision. We promised the public the end of fire use, but left the fuel manager with no way to achieve it. We were wrong, and there is no need to repeat the mistake.

"Futuring" is popular and, as managers, we make many lasting decisions based on our vision of the future. Before we bargain away the use of fire or resign ourselves to its loss, we need to consider the responsible fuel manager who deals by necessity in the stepwise analytical environment.

Fire research has yielded a process that can focus our vision a little by breaking it down into smaller components and using a quantitative scheme to reduce the information. Predictive algorithms for biomass consumption and smoke production are used in a process that is compatible with the way we inventory emissions and plan the year's burn activity--the repeatable process that can be updated with new information or opinions.

My conclusions, based on current opinion and knowledge, is that forest managers and air resource managers can continue to work together to achieve air quality goals in the Pacific Northwest without departing from planned forest management and fire management programs.

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