

Further Remarks on Controlled Burning and Air Pollution

E. V. KOMAREK
Tall Timbers Research Station

At the New Brunswick Tall Timbers Fire Ecology Conference, 1970, I stated in a paper entitled "Controlled Burning and Air Pollution: An Ecological Review" that many of the discussions on air pollution revealed:

“. . . little understanding of the complexities of . . . basic and fundamental principles or of the intricate relationships of fire ecology to the ecology of the whole atmosphere, 'this great, swirling envelope of gases that surrounds the earth' . . ."

In that presentation I discussed the thesis that ecosystems have marvelous and complex "cleansing mechanisms" and we have troublesome pollution when these are "over-loaded." These "cleansing mechanisms" help to maintain an equilibrium in ecosystems. I would like to pursue this subject further with particular emphasis on the particulate emissions from forest fires by posing several questions.

1. Are the carbon particulates from forest fires identical with carbon particulates from man-made sources?
2. Do these "artificial" carbon particulates of man have the same absorbing power of those from forest fires?
3. Are the carbon particulates from forest fires one of the basic "cleansing mechanisms" of the atmosphere?
4. Are the carbon particulates from forest fires helping to cleanse the atmosphere of man-made pollution?

E. V. KOMAREK

However, before discussing these four questions in more detail let me further show that forest fires are of a very ancient lineage and that their particulates have been a part of the natural atmosphere for milleniums. It is rather curious, perhaps a human trait, that in fire ecology the burden of proof has repeatedly been placed upon the fire ecologist whereas everyone believes "Smoky Bear." Burning practices have been consistently condemned without any basis of proof. The most recent perhaps are the findings that the burning of crop residues is not a harmful practice to the soil. This has been in the past, universally condemned. Now studies have shown that it is not a destructive practice. So it has been with evidence proving that forest fires were not created by man but that they have been a natural part of the earth's ecosystem and that the primary ignition trigger has been lightning, another universal force.

In "Ancient Fires" (1972) I have recently brought information together that shows that the dirty black substance on coal is indeed fossil charcoal, called fusain by the coal scientists and that fusain was formed by forest fires, even as early as the carboniferous period. More recently, investigations by Smith, Griffin, and Goldberg (1973) from the Scripps Institution of Oceanography have found carbon in Pacific Ocean sediments deposited from forest fires over the past 100 million years.

Now to the questions:

1. Are the carbon particulates from forest fuels identical with carbon particulates from man-made sources?

Is the structure of the latter particulates identical with those from forest fires? The structure of the particulates may have much to do with their possible "cleansing" power. Certainly if the figures produced for the amount of fallout as given by Smith, Griffin, and Goldberg, some 300,000 tons of carbon particulates a year from forest fires for milleniums, are correct, then they must have some function in the atmosphere. The development of the earth's atmosphere evolved with these particulates and I do not believe we can say that they are not important without investigation as to their structure, and I am tempted to say their correct "taxonomy."

2. Do the "artificial" particulates of man have the same absorbing power as those from forest fires?

The tremendous absorbing power of charcoal is so well known it requires no further discussion. What are the absorbing qualities and powers of various kinds of particulates? We are not being very scientific by lumping all particulates together, even carbon particulates. Again, the taxonomic question.

3. Is the structure and absorbing qualities of the carbon particulates from forest fires one of the basic "cleansing mechanisms" of the atmosphere?

If the particulates from forest fires are charcoal, or charcoal-like, they could well be a very important ingredient of the earth's atmosphere and one of its "cleansing mechanisms." Certainly 300,000 tons of such particulates annually would be of importance in sweeping out of the atmosphere many gaseous pollutants.

4. Are the carbon particulates from forest fires helping to cleanse the atmosphere of man-made pollution?

The particulates given off from forest and grassland fires have recently been found to consist largely of charcoal and ash. Studies made since the Conference, and before the proceedings went to press, have shown a great diversity in form, structure and porosity in such particulate matter. These are very different than those apparently non-absorbent particulates produced from such man-made sources as the combustion engine, burning oil, rubber and plastics. A study has been, and is continuing, conducted by Tall Timbers Research Station in these important matters. A preliminary report based on electron-scanning microscope studies has been published (Komarek, Komarek and Carlisle, 1973).

The temperatures produced in natural fires are in many instances the same as used in the production of activated charcoal. This substance is widely utilized in anti-pollution systems and it would appear that man has only concentrated and modified a "natural cleansing mechanism" for his own use. The ability of particulates from forest and grassland fires as well as their role in cleansing the atmosphere of man-made pollution certainly needs to be studied thoroughly

E. V. KOMAREK, SR.

before such particulate matter is condemned or prohibited merely because of its "nuisance" characteristics.

These four basic questions require answers based on thorough investigation and not by policy making decisions. The cleansing mechanisms of the earth's atmosphere are most complex. The particulates from forest fires have been part of that atmosphere, long before emissions created by man. Certainly a "Taxonomic" base on particulates from various sources must be established on structure, shape, composition, etc., before the ecology of the atmosphere can be properly understood. It is only then that man can determine their function as a cleansing mechanism. I will hazard a guess that the ecology of particulates will be found to be much more complex, intricate and important than is presently recognized.

LITERATURE CITED

- Komarek, E. V. 1970. Controlled Burning and Air Pollution: An Ecological Review. Proc. Tall Timbers Fire Ecology Conf. Fredericton, New Brunswick, Canada. pp. 141-173.
- . 1972. Ancient Fires. Proc. Tall Timbers Fire Ecology Conf. Lubbock, Texas. pp. 219-240.
- Komarek, E. V., Betty B. Komarek, and Thelma C. Carlisle. 1973. The Ecology of Smoke Particulates and Charcoal Residues from Forest and Grassland Fires: A Preliminary Atlas. Misc. Publ. No. 3 Tall Timbers Research Station, Tallahassee, Florida. pp. 1-75.