Waste Problems of Agriculture and Forestry

Finding solutions consistent with rapidly changing concepts of environmental quality related to health, social, and economic goals will not be easy

A few decades ago, animal manure was considered a tremendous asset in making farm soils fertile. Today, a farmer usually finds it cheaper to build up soil nutrient levels by applying synthetic fertilizer from a bag. So, manure accumulates in animal pens in vast quantities. Thus, says a recent Department of Agriculture report, the market place has changed what was once a resource into a waste disposal problem.

The report, "Wastes in Relation to Agriculture and Forestry," surveys 10 major contaminants of air, water, and land soil produced by agriculture and forestry, and how the contaminants affect the two industries in turn. In addition to animal wastes, other organic wastes—such as forest, crop, and processing residues—are also produced as byproducts of the two industries. These substances, carried in water, incur a high biochemical oxygen demand. Dry on land, they can burn, produce odors, or attract flies and vermin.

Big business creates big problems

Domestic animals in the U.S. produce close to 2 billion tons of wastes annually, including excrement, used bedding, paunch manure from abattoirs, and dead carcasses. This quantity of wastes is equivalent to that produced by a human population of 1.9 billion. As much as 50% of this waste is produced by large-scale, confinement-type enterprises. A feedlot handling, for example, 10,000 cattle, accumulates 260 tons of solid and 100 tons of liquid wastes daily. Such large concentrations of animals have greatly magnified the problems of handling wastes, including health hazards and esthetic nuisances.

Removing the waste from animal quarters, transporting it, and—where feasible—spreading it on land represent a significant cost to the meat producer. For example, the manager of a million-bird egg laying operation in Mississippi estimates his annual waste handling costs at $100,000 or 10 cents a bird. A 1961 Michigan study indicates that beef feedlot operators spend $3.43 per head marketed and dairymen $9.29 per head for waste removal and spreading.

Despite these expenditures, operators are encountering problems. As suburbanites move into agricultural areas, they protest against accumulations that give off malodors. The report cites the example of a 27,000-head beef cattle feedlot in Milford, Tex. The owners had purchased enough land, well out in the country, to provide what they thought to be an adequate buffer zone between the lot and the other rural residents. Eleven damage suits averaging about $15,000 each have been filed against them. Four have been settled, the courts allowing claims ranging from $2500 to $7500.

In another instance, the New York State Supreme Court issued a temporary injunction against a large poultry producer in Sullivan County. The injunction restrained the producer, a major employer in the county, from allowing noxious odors to permeate the air of two adjoining resorts pending the outcome of a $125,000 lawsuit against the producer.

Big business. *Health hazards and esthetic nuisances have been created by the use of large-scale, confinement-type enterprises for feeding domestic animals. This 6000-animal feedlot collects 150 tons of solid and 60 tons of liquid wastes daily*

proaches needed

...r research effort must be ...to find economically justi... ...esthetically acceptable an... ...these new, large-scale prob... ...ere is, according to Agricul... ...ert, a pressing need to de... ...design criteria that can be ...fferent situations in different ...the country.

...g the general areas that must ...d: characteristics of manures; ...from livestock quarters; stor... ...sport; feasibility of use on ...disposal by burning, using ...or similar facilities, or bury... ...report lists the following ...research goals:

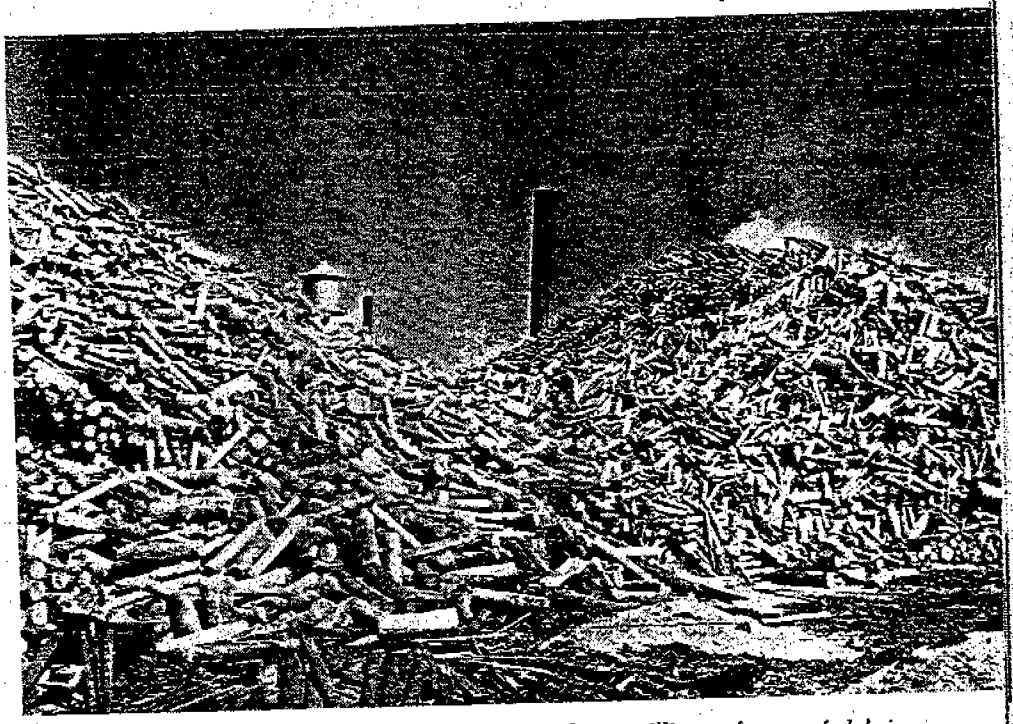
...tify and destroy odor-produc... ...eria prevalent in manures.

...manure to make it less at... ...as a breeding ground for flies ...ria.

...elop better procedures for ap... ...anure to cropland. Odors must ...trolled in storage, and distri... ...and runoff water must not be ...inated.

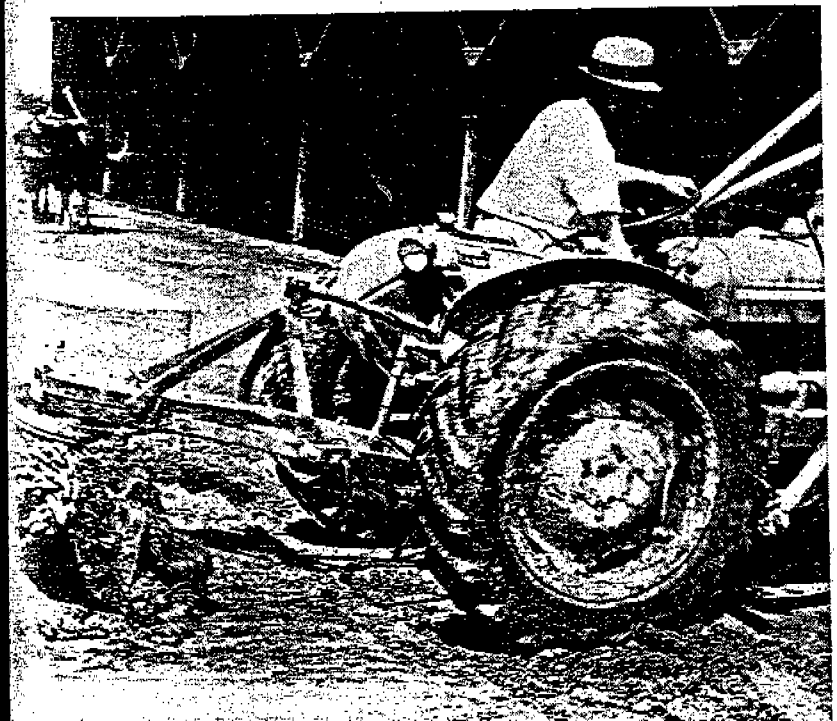
trash

...n average year, 25 million tons ...g debris are left in the woods. ...bris serves as a reservoir for tree diseases, a harbor for insects, and is also an exceedingly serious fire hazard. The average size of forest fires originating in logging waste is more than seven times the average size of fires originating in uncut areas where trash has not accumulated.



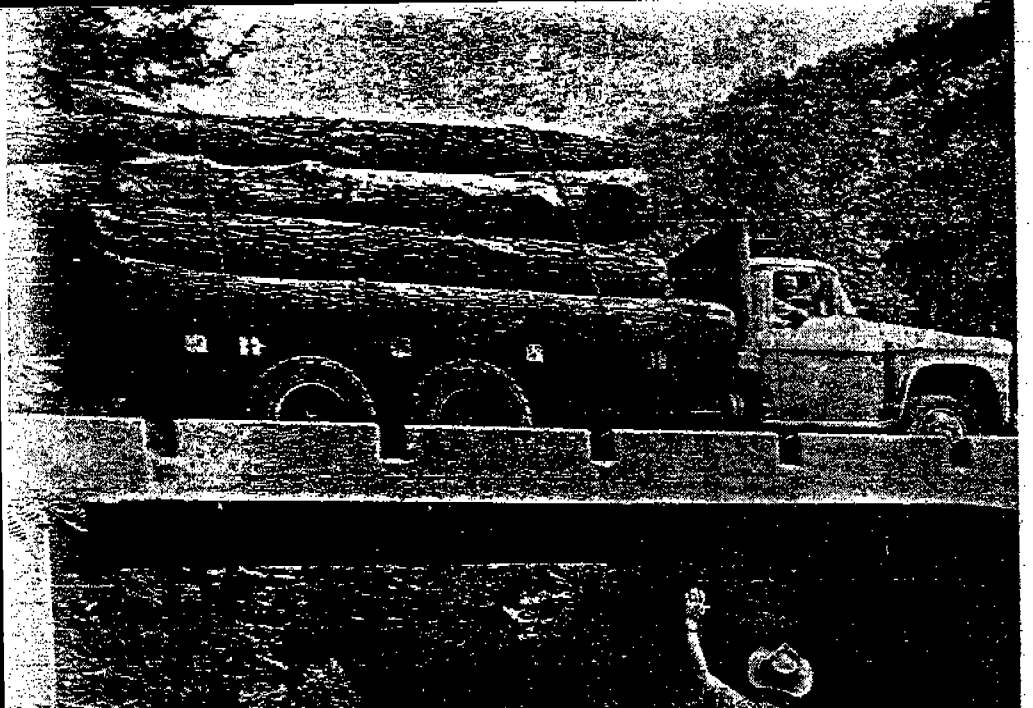
Piles. *Logs find their way to a mill, but left behind are millions of tons of debris. This debris serves as a reservoir for tree diseases, a harbor for insects, and a serious fire hazard. Some of the most disastrous forest fires in North American history started in slash left from logging and land clearing. At present, the material is disposed of by controlled burning, which creates air pollution problems*

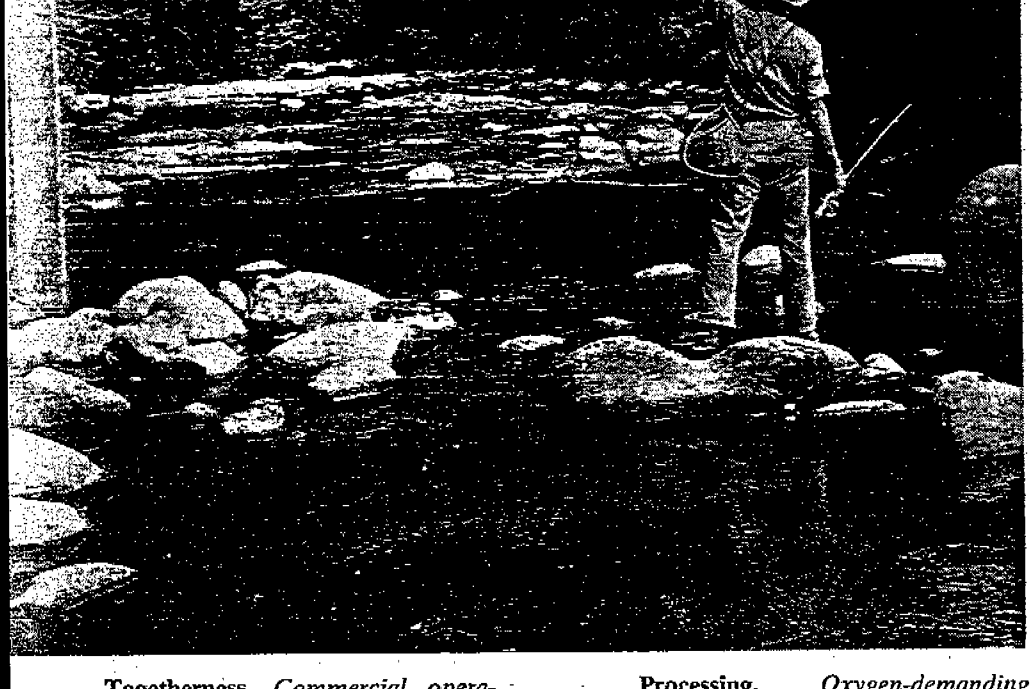
...p. *Infectious agents from agriculture pose public health problems. This ...eedlot is scraped clean then disinfected to kill such organisms as those ...tuberculosis and brucellosis*



At present, controlled burning is the only economically feasible technique for disposing of forest trash en masse. However, both controlled and wild fires produce air pollution. (Wild fires yield more smoke and hydrocarbon because the oxygen deficiency is usually greater during wild burns.)

But even prescribed burning causes problems. For example, Oregon-Washington apple growers have filed suit against the U.S. Forest Service. The growers claim smoke from prescribed burning prevents proper apple coloration. Such smoke has also limited recreational areas and activities and has caused reduced visibility on highways and airfields.





Togetherness. *Commercial operations and recreational activities need not run counter to each other, as this logger-and fisherman show*

Processing. *Oxygen-demanding wastes are produced from processing of agricultural products, such as this tomato canning operation*

Plant residues

Agricultural wastes from orchards, grainfields, and rangelands, especially in the western U.S., are burned—the most widely accepted way to rid the land of such wastes. It is by means of the smoke and other air pollutants that, at least in one way, plant residues contribute to pollution. A second way is their acting as reservoirs of plant diseases and agricultural pests.

As agricultural land in the U.S. becomes more limited and agricultural activities grow more intensive, the danger of plant debris carrying diseases and pests to succeeding crops increases. Control of plant diseases, preferably by developing disease resistance or by other nonchemical means, could solve the disease problem. But until then, burning of residues will continue to be common practice. Although, as the report points out, problems pertaining to handling of crop residues are not top priority items, new and better information is needed to handle these wastes more economically and with fewer harmful side effects.

Processing waste

Processing agricultural
products yields a variety
demanding wastes from
among which are: runo
from sawmilling; proce
from pulp, paper, and
manufacturing; washing and
water from fruit and ve
ning. Also included are
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cleaning dairies, slaughter
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manufacturing cornstarch
tein, sugar refining, malt
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wet processing in textile
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water unpleasant to taste
in many cases, revolting to

The total contribution of
wastes to water, air, and
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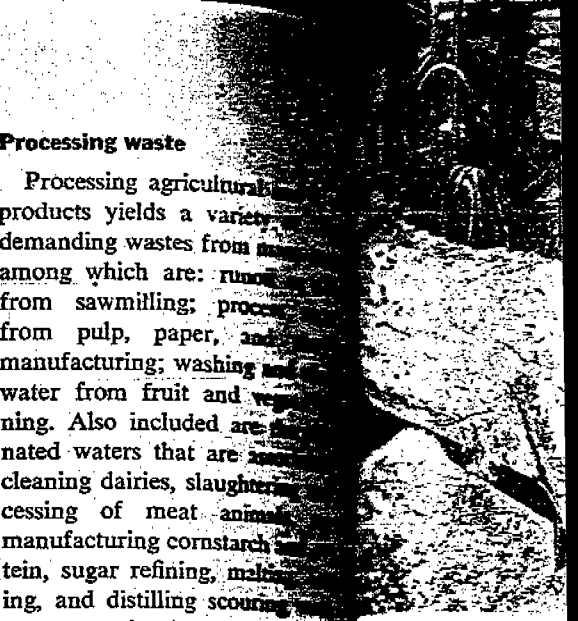
the woodpulp, paper, and
industries alone exceed the



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Useful product. *Converting processing wastes into commercial products is the ideal solution to waste abatement. Some sugarcane bagasse is used as fuel in the factory, but most is dried, baled, then sold to be made into insulation board*

...irements of the raw sewage from ...entire population of the U.S.

...Research has contributed to abate... of processing wastes in three ...:

• Development of useful products, ... as making insulating board out ... sugarcane bagasse. Because of the ...ential economic value of such ...ucts, high priority should be assigned ...earch in this area, according to the ...port.

• Improvement of processes so that ... waste is produced. An example ... such an improvement is the new ...sulfide modification of the kraft ...ocess that yields more pulp while ...ating less waste, air pollution, and ...er pollution. The potential for re...ction in pollution sources by process ...dification is exceedingly high. ...ny steps in processing were de...loped before much attention was ...d to stream contamination by ...uents, and probably could be ...anged to reduce pollution.

• Development of ways of treating ...stes before disposal in streams. ...Oxidative lagoons, for example, that ...d such processing wastes are used ...ectively to reduce the quantity of ...rganic wastes being dumped into ...eams.)

Infectious agents

Throughout history, water contam...ated with infectious agents has ...used human disasters. And such ...asters can still happen. In 1965, ...8,000 residents of Riverside, Calif., ...ere infected with *Salmonella typi-murium* that had entered the city's drinking water. The city's water comes from deep wells, a source presumed to be beyond bacterial contamination. No set of conditions has been found to explain satisfactorily how the water supply became contaminated.

Throughout the nation similar problems are arising. Yet, in view of the large livestock population in the U.S. and the number of livestock diseases that could afflict man, the actual number of infections in the U.S. from drinking water is exceedingly low. During the period 1946–60, only 16 human deaths in the U.S. were attributable to waterborne agents—eight from typhoid fever, four from chemical poisoning, and four from infections other than typhoid.

But as population increases, livestock population will also increase and become even more concentrated geographically. Consequently, greater opportunity will exist for environmental contamination by disease-producing agents from animal sources. In some areas, this source of pollution is already a very serious matter. Recent assays on water from the upper

Marking. *Agriculture has suffered great losses from infectious agents. An economical and effective plan for screening market cattle for brucellosis involves tagging each cow three years old (or older) before it is sent to market*

Potomac Basin indicate that most of the bacterial pollution of this river system comes from nonhuman sources.

Agricultural losses caused by infectious agents carried by air, water, and soil have been heavy. Among the diseases transmitted and which may affect humans are leptospirosis, salmonellosis, brucellosis, tuberculosis, mastitis, and infectious bronchitis. Some progress has been made in controlling such diseases but much remains to be done.

Plant disease agents

Diseases of crops, ornamentals, and trees have caused losses in billions of dollars, despite extensive research to reduce and eliminate the disease agents. Many of the diseases are transmitted by air, water, or soil movements. Control of plant disease agents still has a long way to go. For example, although the potato blight epidemic that caused starvation and misery in Ireland occurred more than 100 years ago, very little is known about the spread of such plant disease epidemics by a contaminated environment. Also, Dutch elm disease and Chestnut blight still leave magnificent trees dead as the diseases sweep the countryside.

Allergens

Close to 12.6 million people annually suffer from asthma or hay fever, notes the Public Health Service. Most cases are due to allergenic pollens. Still, there is little research designed specifically to control plant species that produce allergenic pollen. In fact, there is no complete catalog of allergenic pollen. Much has been learned about control of ragweed, for example, through observations made incidental to other research projects. However, the knowledge has not been put to use in a widespread control operation. Such a program would be necessary for adequate control, since ragweed seed is disseminated by wind and can remain viable in soil for a long time.

Other contaminants

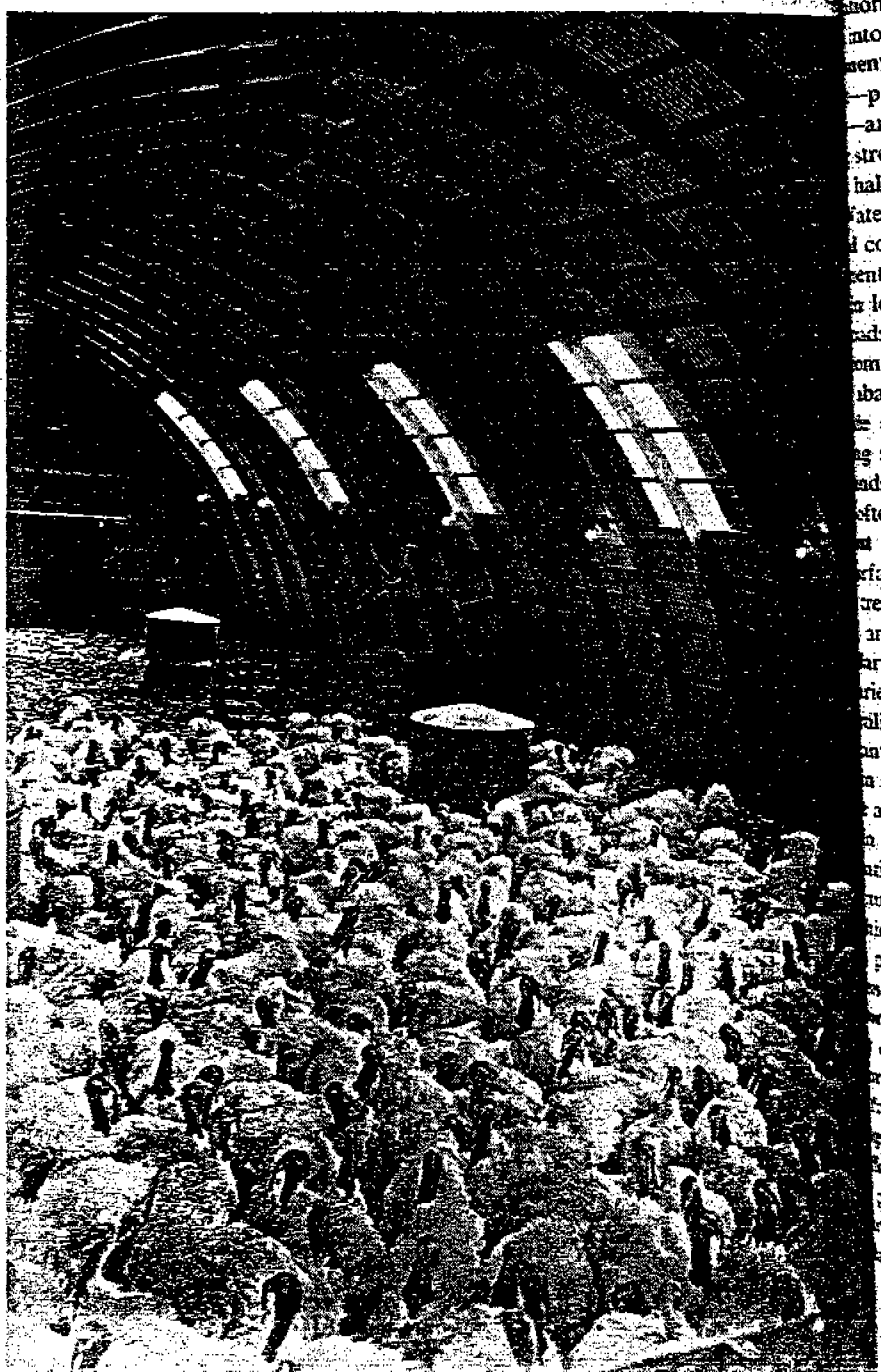
The Dept. of Agriculture report discusses 10 major categories of contaminants to the environment in relation to agriculture and forestry. They are:

• **Radioactive substances.** Agriculture and forestry contribute very little to either actual or potential contamination from radioactivity. However, some phosphate rocks used to produce fertilizer contain very low levels of radioactive uranium and thorium. Agriculture and forestry have suffered only minor adverse effects from this source of contamination.

• **Chemical air pollutants.** Crops, plants, and ornamentals are subjected to chronic injury in and near every metropolitan area. Livestock near mills that produce steel, aluminum, phosphate have been afflicted fluorosis. In southern Californ particularly, acute injury from ch air pollution is widespread.

In the U.S. as a whole, l agriculture and forestry exceed million annually. Agriculture c utes only slightly to chemical lution in the form of hydro and smoke from burning crop in fields. On the other hand,

More big business. *A well-run automated poultry enterprise can 100,000 fowl—and in the process produce 5 tons of wastes daily. The not valuable enough to haul and spread as fertilizer. And when the cumulate they emit offensive odors, afford breeding areas for flies and o min, and provide concentrated sources of pollution for surface and gro*



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fires produce tremendous quantities of smoke.

• **Airborne dusts.** An average of 30 million tons of natural dusts enter the atmosphere annually, most of it originating as soil blowing from inadequately protected fields under cultivation, deteriorated rangelands, and sand dunes. Not only is the land robbed of its topsoil, but a serious air pollution problem is created. However, progress is being made. The Kansas drought of the mid-1950's was just as severe as the Dust Bowl drought of the 1930's. But in the 1950's soil blowing was not nearly so serious. Another major source of airborne dust is industry—cotton gins, alfalfa mills, lime plants, cement plants, smelters, and mining operations—which releases 17 million tons into the atmosphere annually.

• **Sediment.** Nearly 4 billion tons of sediment—primarily soils and mineral particles—are washed by storms into waterways streams in the U.S. each year. At least half comes from agricultural lands. Watershed research has shown that good cover is the major deterrent to sediment delivery. Improved technology in logging and construction of forest roads has reduced sediment delivery from forest operations. Research on the abatement of wild forest fires has made a major contribution in diminishing sediment delivery from forested lands. Soil loss from a burned area is often great.

• **Plant nutrients.** Plant nutrients enter surface water by the discharge of raw or treated sewage, some industrial wastes, and runoff and seepage from land. Barnyards and feedlots yield a large variety of nutrients. Use of chemical fertilizers is suspected as being a significant source of plant nutrients found in streams and lakes. Detergents provide an abundance of soluble phosphate in sewage effluents. Much more information is needed on the role of plant nutrients in algal growth and eutrophication, and a variety of research projects on the subject are in progress.

• **Inorganic salts and minerals.** The quality of soils and waters is impaired by inorganic salts and minerals that come from natural deposits, acid mine drainage, industrial processes, and return flow from irrigated areas. The major problems created by inorganic salts and minerals occur when salt accumulates in irrigated soils and reduces crop production. Of the 30 million acres of irrigated land in the 17 western states, about half have a potential problem with salinity.

• **Organic wastes.** These materials—forest trash, crop residues, sewage, animal wastes, food and fiber processing wastes—create the well-known and troublesome high biochemical oxygen demands (BOD) when they are carried in water. But on land the problem is no better, only of a different kind: they produce odors, are susceptible to fire, and attract flies and vermin. There are ways to use some of the contaminated water for agricultural purposes, but more research is needed on the effects of using such water on many crops. Also, much more data are needed on the relationship between low water flow and the level of water contamination.

• **Infectious agents and allergens.** Whether it be animal or plant disease agents or whether it be allergens alone, the fact is that soil, water, and air all serve as carriers for the agents or allergens that affect man, animals and plants. The control of such afflicting materials is possible, but only to a limited extent. Before reasonable control measures can be started we must first learn the source of the infectious agents and the distribution and physiological effect of the plant species that produce allergenic pollen. There is little doubt of the ubiquitous occurrence of all these troublesome materials; the problem arises in mounting effective control programs for such pervasive materials.

• **Agricultural and industrial chemicals.** The discharge of synthetic organic chemicals such as detergents and pesticides has created environmental problems in our modern society. However, the benefits to agriculture far outweigh the damages, says Agriculture's report. Chlorinated hydrocarbons have caused considerable concern because of their persistence. Farming itself has suffered from the loss of honey bees and other beneficial insects through the consequences of pesticide vapors, and spray drift.

Dis-assembly line. *Poultry processing also produces large quantities of oxygen-demanding wastes. In addition, these wastes make the water unsightly, unpalatable, and malodorous. More research needs to be done on such wastes to reduce quantities, improve treatment techniques, and possibly to develop useful products*

• **Heat.** Agriculture and forestry contribute little heat to streams and lakes. Although heat does not have a major adverse effect on agriculture and forestry, the growing interest in providing recreational opportunities in rural and forested areas means fish and other aquatic life must be protected from heat pollution. Heat pollutes water in that the amount of oxygen water can hold in solution decreases with increasing temperature.